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ABSTRACT

This elementary school teaching unit was developed as a part of a series of units that deal with Lake Erie. This unit was developed to enable children to: (1) examine a moving fish; (2) conduct experiments with a live fish; (3) understand the swimming habits of fish; (4) learn how fish breathe; (5) recognize different methods of fish protection and habitats; and (6) compare a fish and a whale. The document contains a unit outline, descriptions of activities and experiments, background information for the teacher, reproducible worksheets, a list of vocabulary words, overhead transparency masters, suggestions on how children might create their own unit booklets, and library references. The last eight pages are designed to be removed, laminated, and connected to form posters that can be written on with watercolor markers and crayons. (TW)

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Lake Erie... a day in the life of a Fish

SE 048 333

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this Lake Erie unit has been developed especially for teachers and children in the Elementary grades

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UNIT 3

A DAY IN THE LIFE OF A FISH

OBJECTIVES: The children will be able to

1. Examine a moving fish.
2. Conduct experiments with the live fish.
3. Understand the swimming habits of fish.
4. Learn how fish breathe.
5. Recognize different methods of fish protection and habitats.
6. Compare a fish and a whale.

I. Observe live goldfish

A. Experiments to discover how fish react
B. Worksheets to record goldfish data
C. Activities to be used individually, in small groups or large groups

II. Find out how fish swim

A. Nostrils - used to smell chemicals in the water

B. Fins:
1. Dorsal - used for balance and to keep fish upright
2. Caudel - tail serves as a rudder or stabilizer - can move fish forward by back and forth movements - power
3. Anal - used for balance and stopping
4. Pelvic - like our legs - can stop or start quickly - keeps fish upright
5. Pectoral - like our arms - can turn quickly right or left - aids in steering

C. Lateral lines - series of pits in skin that look like dotted lines

1. The nerves in the pits tell how deep the water is, how wavy, and what sounds are present.
2. The nerves work like radar.

D. Swimming patterns

1. Schools
2. Swimming and the current
3. Weightlessness
4. Swim bladder

E. Activities

1. Observe goldfish moving and swimming.
2. Make a fan and use it for movement.
3. Use flippers like a pelvic fin.
4. Wear different fins and act out their job in swimming.
5. Match fins and their job.
6. Create a movable fish with fins.
7. Conduct science experiments on fish swimming.
8. Use a flashlight in the dark to be like the fish's lateral lines in the dark sea.
9. Compare lateral lines with radar and sonar.
10. Create a chart of special organs other animals have.
11. Write creatively:
    a. I am a fish. I use my dorsal fin to....

III. Discover how fish breathe

A. Fish have gills.

B. Activities

1. Observe real goldfish and see how they breathe.
2. Using fish models, find gills and gill coverings.
3. Using slit paper, act out gills and gill coverings.
4. Compare human and fish breathing - make a chart or bulletin board.
   a. mouth open all of the time (we use nose or mouth)
   b. both need oxygen
   c. goes out through slits (we swallow)
   d. get oxygen from water (we get oxygen from air)
5. Cut and paste - label mouth, gills, gill coverings.
6. Conduct a science experiment on breathing.

IV. Examine different methods of fish protection

A. Protective coloring and shape.
B. Locomotion - speed and maneuverability
C. Appendages
D. Habitat
E. Activities

1. Hidden pictures
2. Watch fish in maze and time them.
3. Count their teeth. How many rows are there and where are they located?
4. Create a bulletin board.
5. Act out fish in schools.
6. Riddles
7. Field trips
8. Matching - picture and protection
9. Idea guide

VOCABULARY

dorsal fin	pectoral fin	pelvic fin	current
anal fin	caudal fin	adipose fin	camouflage
barbels	lateral lines	gills	protection
oxygen	spines	gill covers	appendages
scales	marine biologist	school	
locomotion	adaptation	swim bladder	

CHART
OVERHEAD TRANSPARENCY MASTERS
CHILD'S BOOKLET
LIBRARY REFERENCES
POSTER

STREAMLINED UNIT - may be taught in one week

A Day in the Life of a Fish

A. Fish experiments
B. How a fish swims
C. How a fish breathes
D. How a fish protects itself
E. Comparing a fish and a whale

GETTING TO KNOW THE GOLDFISH

To The Student

You have probably seen goldfish all your life, but have you ever really taken time to look at them carefully? This is your chance to sit down and do this.

- Are the gills moving?
- Where are the fish swimming? At the bottom of the tank? At the top of the tank? Halfway between the bottom and the top?
- What factors determine this?
  Temperature of water?
  Amount of oxygen in the water?
  Location of the food supply?

As you watch the fish you will probably come up with some questions of your own. Perhaps you can plan a way to try to find an answer. Then again you may not be able to find an answer to all your questions. Working with living things is difficult because it is sometimes hard to control the variables. Even scientists do not always find an answer to all their questions. There is always a lot more they would like to know.

Some general rules to keep in mind when you are working with fish:

- Never do anything harmful to the fish.
- If fish have to be handled, wet your hands each time you handle them.
- Always wash your hands after working with animals.

To The Student

YOU WILL NEED:

- GOLDFISH OF MEDIUM SIZE
- JARS WITH TIGHT-FITTING LIDS
- CONTAINERS FOR FISH
- FISH FOOD
- FLASHLIGHT
- PEBBLES
- ICEBUCKET WITH ICE CUBES
- DROPPERS
- THERMOMETERS
- SMALL EARTHWORMS OR MEALWORMS IF AVAILABLE
- LIVER
- TIMER - CLOCK WITH A SECOND HAND
- LIQUID THERMOMETERS
- LIGHT BULBS: 15 WATT
  60 WATT
  100 WATT
- DESK LAMP

From Dora Dean, former Science Supervisor, Lakewood Public Schools, and Project Challenge, Rocky River Public Schools

GETTING TO KNOW THE GOLDFISH - TASK CARD #1
(Teacher Guide)

1. The fish propels itself through the water using its fins and tail.
   A. The caudal fin and pelvic fins are used when moving forward.
   B. The pelvic fins, pectoral fins and anal fin are used when moving backward.
   C. The fish turns left using the right pectoral fin.
   D. The fish turns right using the left pectoral fin.
   E. The fish stops using the pelvic fins, the pectoral fins and the anal fin.
   F. The fish has an air bladder in the upper part of its body cavity. This is inflated by gases that pass into it from the blood. The bladder acts as a float, causing the fish to go up when the bladder fills with gas and allowing the fish to go down when gases are released.
   G. The fish uses the dorsal fin and the anal fin for balance when it is not moving.

2. The fish should feel smooth and moist.

3. -

4. Yes, goldfish do see well. Carefully put something near the eye and notice how it responds to the stimuli. Fish are nearsighted, however, and can't see things that are far away.

5. There are no ears. Sound vibrations are transmitted to ear structures through the skull bones. The lateral line also acts as a sense organ. It picks up low frequency under-water vibrations.

6. Fish have two nostrils in front of their eyes that are used to detect odor. Nostrils are not used for breathing.

From Dora Dean, former Science Supervisor, Lakewood Public Schools, and Project Challenge, Rocky River Public Schools

GETTING TO KNOW THE GOLDFISH - TASK CARD #1

OBSERVING GOLDFISH

LOOK AT THE GOLDFISH AND SEE HOW MANY THINGS YOU CAN DISCOVER THAT YOU NEVER NOTICED BEFORE.

YOU HAVE LOOKED AT GOLDFISH ALL YOUR LIFE, BUT HAVE YOU REALLY SEEN THEM? THIS SHEET CAN BE USED TO HELP GUIDE YOUR OBSERVATIONS. AFTER OBSERVING CAREFULLY FOR ANSWERS TO THESE QUESTIONS, COMPARE YOUR FINDINGS WITH THOSE OF YOUR CLASSMATES.

PLACE A GOLDFISH IN A CONTAINER WHICH ALLOWS IT ROOM TO SWIM AROUND. OBSERVE IT CAREFULLY. USE A PIECE OF YOUR TABLET PAPER TO ANSWER THESE QUESTIONS.

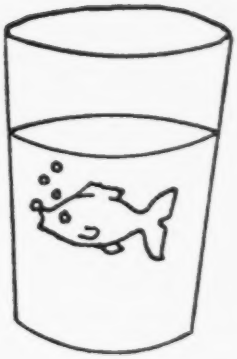
1. HOW DOES IT PROPEL ITSELF THROUGH THE WATER?_____

   A. WHICH FINS SEEM TO BE USED FOR MOVING FORWARD?_____

   _____

   B. WHICH FINS ARE USED WHEN MOVING BACKWARD?_____

   _____



   C. HOW DOES THE FISH TURN LEFT?_____

   _____

   D. HOW DOES THE FISH TURN RIGHT?_____

   _____

   E. HOW DOES THE FISH STOP?_____

   _____

   F. HOW DOES IT GO UP AND DOWN?_____

   _____

   G. WHAT FINS ARE USED FOR BALANCE WHEN THE FISH IS NOT MOVING?_____

NAME_____

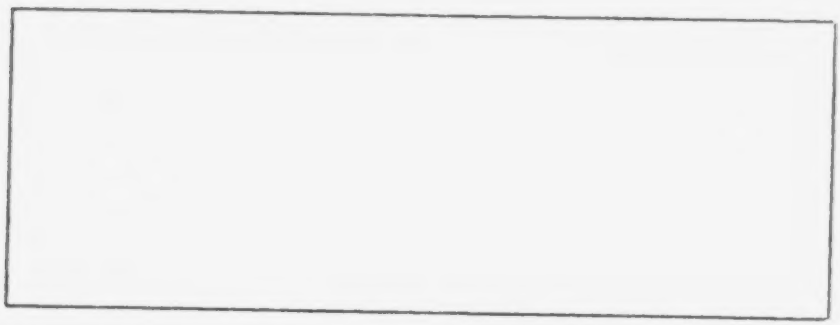
DATE_____

GETTING TO KNOW THE GOLDFISH - TASK CARD #1 (CONT.)

OBSERVING GOLDFISH

2. WET YOUR FINGER AND CAREFULLY TOUCH THE SIDE OF THE FISH. HOW DOES IT FEEL?_____

NOTICE THE SCALES. DRAW A SECTION OF THE COVERING OF THE FISH.



3. OBSERVE THE GILLS COVERING THE HOLES IN THE SIDE OF THE BODY. NOTICE THAT THE FISH OPENS ITS MOUTH PERIODICALLY TAKING IN WATER WHICH PASSES OUT THROUGH THE GILLS.

4. OBSERVE THE EYES. WATCH TO SEE IF THEY CLOSE. DO GOLDFISH SEE WELL? HOW CAN YOU TELL?_____

_____

5. LOOK FOR EARS OR ANYTHING THAT MIGHT TAKE THE PLACE OF EARS. DO YOU SUPPOSE THAT FISH CAN HEAR?_____

_____

6. DO THEY HAVE A NOSE FOR SMELLING? DO YOU SEE ANY OPENINGS WHICH MIGHT CORRESPOND TO THE NOSTRILS OF MAMMALS?_____

LIST QUESTIONS YOU MIGHT LIKE TO INVESTIGATE FURTHER.

A._____

_____

NAME_____

DATE_____

GETTING TO KNOW THE GOLDFISH - TASK CARD #1 (CONT.)

OBSERVING GOLDFISH

B._____

_____

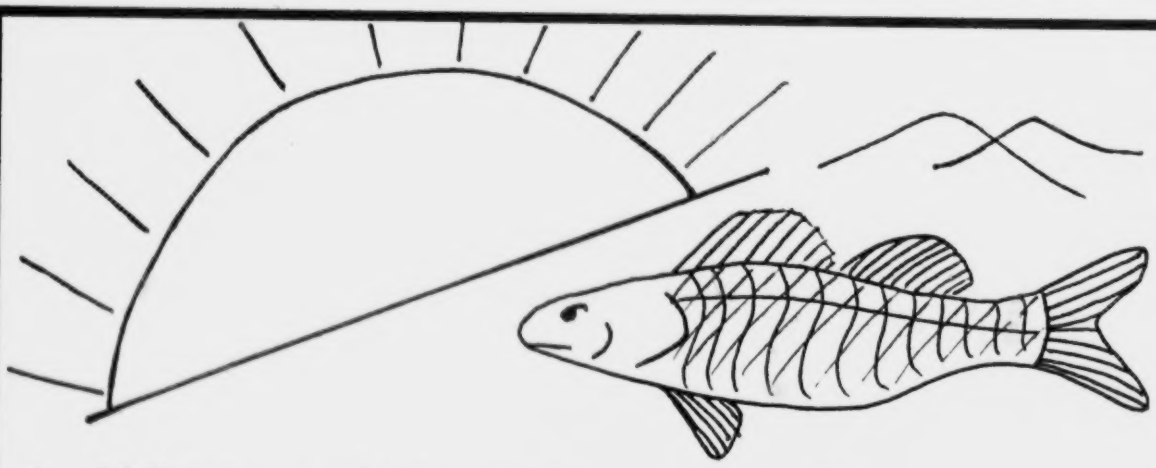
C._____

_____

_____

TEACHER APPROVAL

From Dora Dean, former Science Supervisor, Lakewood Public Schools, and Project Challenge, Rocky River Public Schools



1. When a fish gets up in the morning does it open its eyes? _____. Why_____.

2. Does it take a deep breath? _____. How? _____.

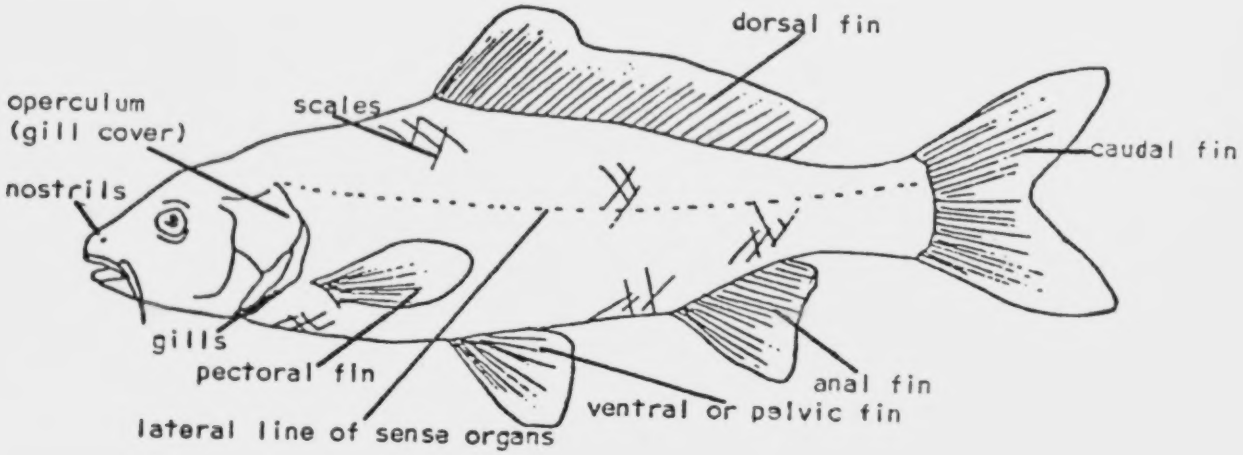
3. Show what it might eat for breakfast.

GETTING TO KNOW THE GOLDFISH - TASK CARD #2

READ TO LEARN

BY READING THIS INFORMATION SHEET, YOU WILL LEARN TO KNOW MORE ABOUT THE GOLDFISH.

THE BODY OF THE FISH IS STREAMLINED, WHICH MAKES IT POSSIBLE FOR IT TO MOVE QUICKLY THROUGH THE WATER. THE BODY IS COVERED WITH SCALES WHICH OVERLAP LIKE THE SHINGLES ON A HOUSE. THE SKIN OF THE FISH GIVES OFF A SLIME WHICH COVERS THE BODY AND PROTECTS THE FISH FROM SMALL PARASITES FOUND IN THE WATER.



EACH FIN IS MADE UP OF MANY BONES COVERED WITH A LAYER OF SKIN. THE PECTORAL FINS NEAR THE HEAD CORRESPOND TO THE FRONT LEGS OF LAND VERTEBRATES. THE PELVIC FINS ARE JUST BEHIND THE PECTORAL FINS AND CORRESPOND TO THE BACK LEGS OF LAND ANIMALS. ONE OR TWO DORSAL FINS ARE LOCATED ON THE TOP OF THE TRUNK AND ALONG THE BOTTOM TOWARD THE REAR IS THE ANAL FIN. THE TAIL OF THE FISH ENDS IN A CAUDAL OR TAIL FIN.

GETTING TO KNOW THE GOLDFISH - TASK CARD #2 (CONT.)

READ TO LEARN

FISH ARE COLD-BLOODED ANIMALS SINCE THEIR TEMPERATURE IS THE SAME AS THAT OF THE SURROUNDING ENVIRONMENT. THIS MEANS THAT THEIR TEMPERATURE WILL CHANGE WITH THE SEASONS.

FISH BREATH THROUGH GILLS AT EACH SIDE OF THE HEAD. WHEN A FISH OPENS ITS MOUTH, WATER RUSHES IN. AS THE FISH CLOSES ITS MOUTH, WATER IS FORCED OUT THROUGH TWO OPENINGS ON EACH SIDE OF THE BODY. IN EACH OPENING ARE GILLS AND AS THE WATER PASSES OVER THE GILLS, DISSOLVED OXYGEN IN THE WATER PASSES THROUGH THE THIN WALLS OF THE BLOOD VESSELS AND IS CARRIED TO THE REST OF THE BODY BY THE BLOOD. CARBON DIOXIDE IS PICKED UP FROM THE CELLS BY THE BLOOD AND IS CARRIED TO THE GILLS WHERE IT IS RELEASED THROUGH THE GILLS INTO THE WATER.

THE FISH MOVES ITS TAIL AND TAIL FIN TO MOVE RAPIDLY THROUGH THE WATER. DORSAL AND ANAL FINS ARE USED FOR BALANCE. THE PECTORAL AND ANAL FINS ARE ALSO USED FOR BALANCE. THEY ACT AS OARS TO STEER THE FISH IN SWIMMING AND WHEN SPREAD OUT, THEY HELP THE FISH COME TO A STOP. THESE ARE ALSO USED BY THE FISH FOR SWIMMING BACKWARDS.

MOST FISH HAVE AIR BLADDERS IN THE MIDDLE OF THEIR BODY WHICH ARE USED TO MAKE IT POSSIBLE FOR THE FISH TO RISE OR SINK IN THE WATER.

MOST FISH HAVE EYES WITH LARGE PUPILS WHICH CAN ADMIT A GREAT DEAL OF LIGHT; BUT THEY HAVE NO EYELIDS SO IT IS IMPOSSIBLE TO TELL

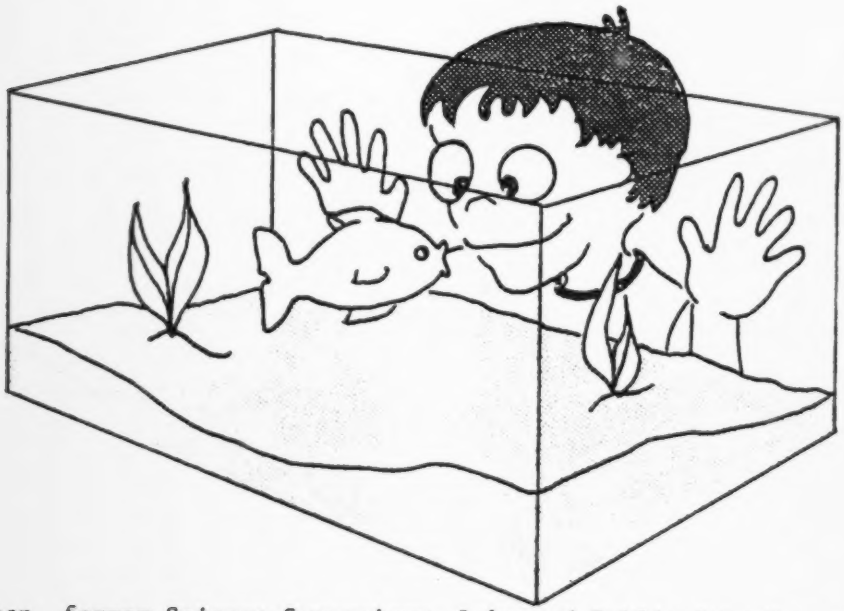
GETTING TO KNOW THE GOLDFISH - TASK CARD #2 (CONT.)

READ TO LEARN

WHETHER OR NOT THE FISH SLEEPS.

FISH HAVE NO EARS, BUT THEY SEEM TO SENSE SOUND WITH AN AUDITORY CAPSULE DEEP WITHIN THE HEAD. IN MANY FISH, A LINE OF SENSORY SCALES RUNS ALONG BOTH SIDES OF THE BODY FROM HEAD TO TAIL. THESE SCALES ARE ESPECIALLY SENSITIVE TO SOUNDS OF LOW PITCH.

THE TASTE SENSE SEEMS TO BE LACKING, BUT A FISH IS SENSITIVE TO ODORS. LITTLE HOLES ON THE NOSE LEAD TO ORGANS OF SMELL JUST BELOW. THE FISH'S WHOLE BODY SEEMS TO BE SENSITIVE TO TOUCH.



From Dora Dean, former Science Supervisor, Lakewood Public Schools, and Project CHallenge, Rocky River Public Schools

Necessary Equipment for Swimming

Cut out 6 aids in swimming and paste them next to the correct section in the following page.

1. Dorsal fin(s) - used for balance to keep fish upright.

2. Anal fin - used to keep balance and stop.

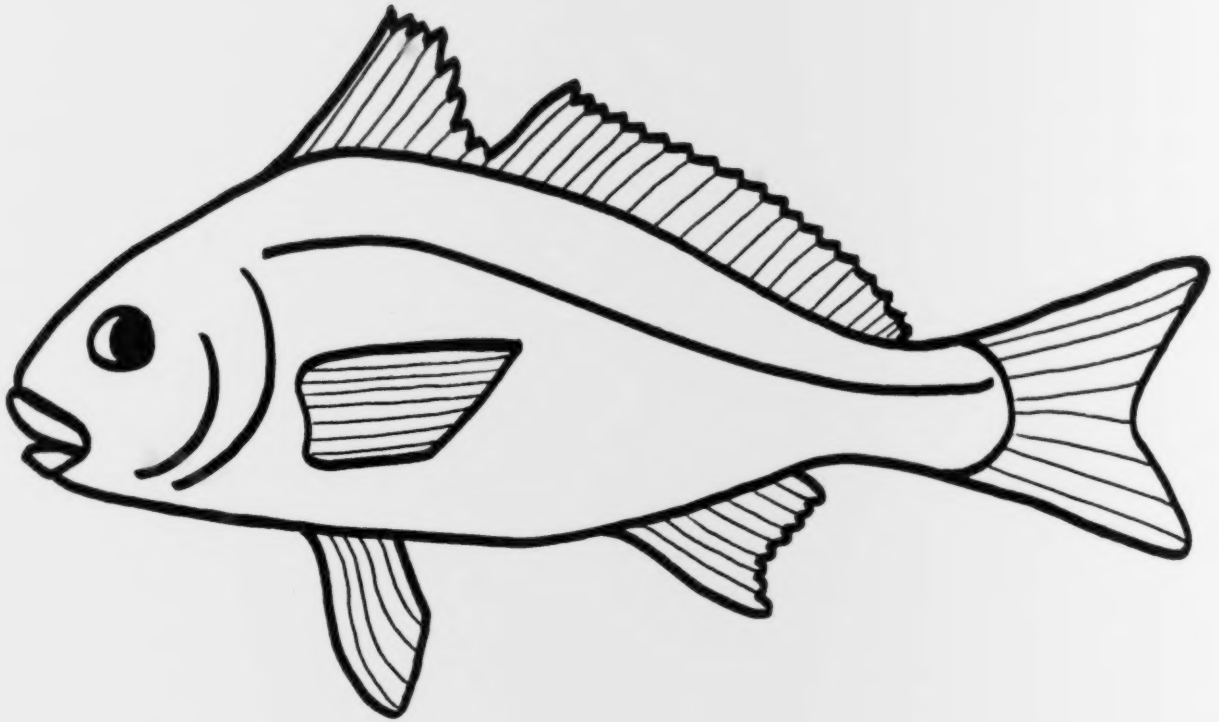
3. Lateral line - serves as radar for pressure and sound.

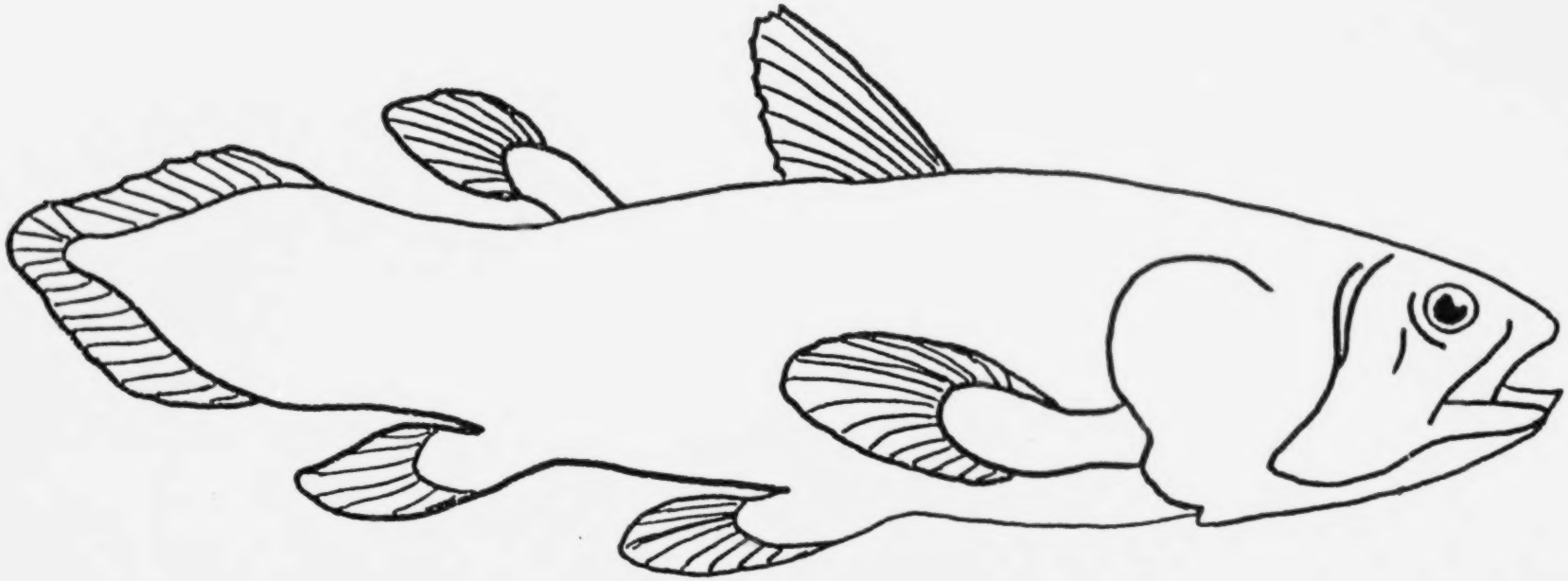
4. Caudal fin (tail) - gives powerful push and serves as a rudder to move fish forward.

5. Pelvic fin - like our legs - can stop or start quickly and keeps fish upright.

6. Pectoral fin - like our arms - aids in steering right or left quickly or up and down.

Necessary Equipment for Swimming





A living fossil

1. Draw a line over the fin used for power.
2. Circle a fin that is like an airplane's wing.
3. Draw a heavy black line on the fish's gill flap.
4. Color your fish.

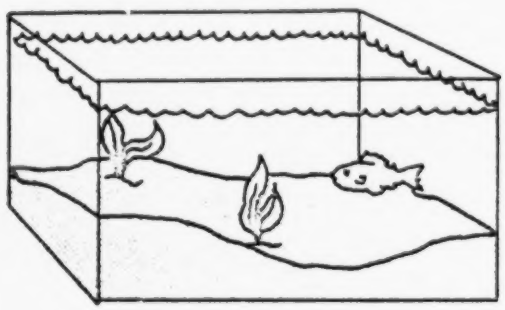
(From Marine Science Center, Poulsbo, WA; James A. Kolb, Author/Editor

GETTING TO KNOW THE GOLDFISH - TASK CARD #3

Investigating A Goldfish

> Investigate one of the questions often asked: Where do most of the goldfish feed? You will learn one method of gathering data and evaluating your findings.

Work with a number of different goldfish. The more data collected, the more reliable your findings. Do not feed the goldfish the day before the experiment. Use tiny bits of liver for food.



Decide on a hypothesis to test; for example, you might decide to use this one: "Most Goldfish Feed at the Surface of the water". This is but one possibility. Make up your own.

Place your hypothesis on a piece of your own paper. Then prepare a chart similar to the one on the next page to collect your data.

NAME_____

DATE_____

GETTING TO KNOW THE GOLDFISH - TASK CARD #3 (CONT.)

INVESTIGATING A GOLDFISH

	WHERE DO THESE GOLDFISH USUALLY FEED?			
	NEAR THE SURFACE OF THE WATER	ONE-HALF WAY TO THE BOTTOM	ON THE BOTTOM	COULDN'T TELL
FISH 1				
FISH 2				
FISH 3				
FISH 4				
TOTALS				

PUT A MARK IN ONE OF THE BLOCKS EACH TIME A GOLDFISH EATS. TRY DROPPING ONE PIECE OF FOOD AT A TIME. IF THE GOLDFISH DOES NOT FIND IT, YOU MAY NEED TO SCATTER FOOD AND OBSERVE WHERE THE GOLDFISH PICKS IT UP. WHICHEVER WAY YOU CHOOSE, USE THE SAME METHOD EACH TIME.

ANSWER THESE QUESTIONS:

1. WHAT DO YOUR FINDINGS SEEM TO INDICATE?
2. DOES THERE SEEM TO BE A COMMON PATTERN?
3. DOES YOUR DATA SUPPORT YOUR HYPOTHESIS?

PUT YOUR DATA TOGETHER WITH THAT OF OTHER MEMBERS OF YOUR CLASS, BUT ONLY IF YOU HAVE USED THE SAME PROCEDURE AND THEREFORE HAVE CONTROLLED

GETTING TO KNOW THE GOLDFISH - TASK CARD #3 (CONT.)

INVESTIGATING A GOLDFISH

THE SAME VARIABLES.

CHECK THESE STEPS IN YOUR PROCEDURE:

- DID YOU MARK THE "HALF WAY TO THE BOTTOM" AREA?
- DID YOU USE THE SAME FOOD EACH TIME?
- DID YOU CHOOSE FOOD OF THE SAME SIZE?

WHEN YOU REPEATED THE EXPERIMENT THE SECOND DAY, DID YOU WITHHOLD FOOD THE SAME LENGTH OF TIME BEFORE EXPERIMENTING?

WHEN YOU DID THESE THINGS, YOU WERE CONTROLLING VARIABLES.

INVESTIGATING WITH ANIMALS IS MADE DIFFICULT BY THE FACT THAT THERE ARE SOME VARIABLES WHICH CAN NOT BE CONTROLLED, BUT IT IS WELL TO CONTROL ALL THAT YOU CAN IF YOU WANT RELIABLE DATA.

CAN YOU GENERALIZE FROM THE DATA COLLECTED OR ARE THE RESULTS SO VARIED THAT THIS CAN NOT BE DONE? WOULD YOU CONCLUDE, FOR EXAMPLE, THAT THEY FEED AT NO ONE PARTICULAR DEPTH?

SINCE THE BEHAVIOR OF ANIMALS IS SO COMPLEX ANY ANSWER WHICH CAN BE BACKED UP BY DATA CAN BE TENTATIVELY ACCEPTED . . . . ALWAYS SUBJECT TO FURTHER INVESTIGATION AND POSSIBLE CHANGE.

_____

TEACHER APPROVAL

From Dora Dean, former Science Supervisor, Lakewood Public Schools, and Project Challenge, Rocky River Public Schools

GETTING TO KNOW THE GOLDFISH - TASK CARD #4

STIMULUS AND RESPONSE

WHEN YOU HAVE COMPLETED THIS ACTIVITY YOU WILL HAVE PRACTICED ONE METHOD OF INVESTIGATING TO FIND AN ANSWER TO AN OPEN-ENDED QUESTION, ONE IN WHICH THE ANSWER DEPENDS ENTIRELY UPON THE DATA YOU COLLECT.

BY THIS TIME YOU UNDOUBTEDLY HAVE A WHOLE LIST OF QUESTIONS YOU HAVE ASKED. HERE ARE SOME GATHERED BY A GROUP OF STUDENTS WHO TRIED OUT THIS MATERIAL:

1. IS IT POSSIBLE FOR A GOLDFISH TO SWIM UPSIDE DOWN? YOU WILL NEED A TIGHTLY CAPPED JAR FOR THIS EXPERIMENT. WORK OVER A SINK OR DISH. TURN THE JAR OVER AND SEE WHAT HAPPENS TO THE GOLDFISH.
2. WOULD A FISH STAY RIGHT-SIDE-UP IN THE DARK? YOU WILL NEED A FLASHLIGHT FOR THIS ONE.
3. DOES A FISH FIND FOOD BY SIGHT OR BY SMELL? PERHAPS YOU COULD DROP PEBBLES AS WELL AS LIVER. CAN IT DISTINGUISH BETWEEN THE TWO?

DROP A BOOK ON A DESK BEHIND ONE OF YOUR FRIENDS. HOW DOES YOUR FRIEND REACT? CHANCES ARE THAT HE JUMPS AND TURNS AROUND QUICKLY. WE CAN CALL THE NOISE THE STIMULUS AND HIS REACTION, THE RESPONSE. DOES A GOLDFISH RESPOND TO STIMULI (PLURAL) IN THE EVIRONMENT? THINK OF SOME STIMULI TO WHICH THEY MIGHT RESPOND.

GETTING TO KNOW THE GOLDFISH - TASK CARD #4 (CONT.)

STIMULUS AND RESPONSE

DID YOU THINK OF:

- SOUND (TAPPING ON THE SIDE OF THE AQUARIUM)
- LIGHT (BE SURE THE RESPONSE IS TO LIGHT AND NOT HEAT AND LIGHT. PERHAPS YOU CAN USE A FLASHLIGHT.)
- TOUCH (TOUCH THE FISH LIGHTLY. WHAT PARTS OF THE BODY RESPOND TO TOUCH?)

DECIDE WHAT QUESTION YOU WOULD LIKE TO INVESTIGATE AND CHECK YOUR PLANS WITH YOUR TEACHER. YOU MIGHT WANT TO CHECK THE RESPONSE OF GOLDFISH TO A NUMBER OF DIFFERENT STIMULI. KEEP A RECORD OF YOUR FINDINGS ON A DATA SHEET SIMILAR TO THE ONE CALLED ANIMAL RESPONSE IN THIS TASK. MAKE A MARK IN THE PROPER COLUMN AFTER EACH TRIAL.

BE SURE TO KEEP ALL FACTORS (VARIABLES) THE SAME EXCEPT FOR THE ONE YOU ARE TESTING. FOR EXAMPLE, IN TESTING FOR SOUND, MAKE THE SOUND WITH THE SAME INSTRUMENT AT THE SAME PLACE EACH TIME.

NAME_____

DATE_____

GETTING TO KNOW THE GOLDFISH - TASK CARD #4 (CONT.)

STIMULUS AND RESPONSE

ANIMAL RESPONSE

GOLDFISH	POSITIVE RESPONSE (MOVES TOWARD)	NEGATIVE RESPONSE (MOVES AWAY)	NO RESPONSE	COMMENTS
SOUND				
LIGHT				
TOUCH				
TOAD OR FROG SOUND				
LIGHT				
TOUCH				
OTHER ANIMAL VARIETY SOUND				
LIGHT				
TOUCH				

_____

TEACHER APPROVAL

From Dora Dean, former Science Supervisor, Lakewood PUblic Schools, and Project Challenge, Rocky River Public Schools

GETTING TO KNOW THE GOLDFISH - TASK CARD #5

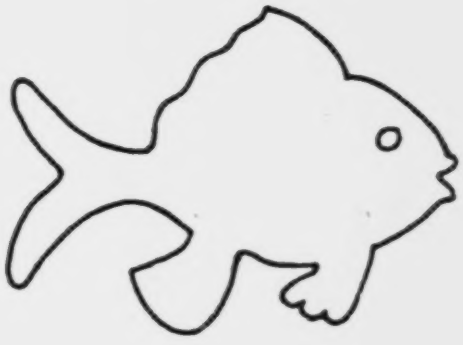
THE GOLDFISH MYSTERY

NOW YOU ARE READY FOR A MORE CHALLENGING TASK IN WHICH YOU CAN APPLY WHAT YOU HAVE LEARNED ABOUT EXPERIMENTING. IN THIS ACTIVITY YOU WILL INVESTIGATE TO FIND A RELATIONSHIP BETWEEN EITHER ONE OR BOTH OF THE FOLLOWING:

- TEMPERATURE OF WATER AND THE BREATHING RATE OF FISH
- AMOUNT OF LIGHT AND THE BREATHING RATE OF FISH

READ THE STORY "THE GOLDFISH MYSTERY" IN THIS TASK FOUND ON THE NEXT PAGE.

ON YOUR OWN PAPER WRITE DOWN THREE HYPOTHESES ON WHY THE BREATHING RATE OF THE FISH CHANGES. BASE YOUR HYPOTHESES ON THE INFORMATION IN THE STORY. MAKE A PLAN TO TEST ONE OF THE HYPOTHESES.



NAME_____

DATE_____

GETTING TO KNOW THE GOLDFISH - TASK CARD #5 (CONT.)

THE GOLDFISH MYSTERY

JIM AND BILL, TWO BROTHERS WHO LIVED IN NEW YORK, BOUGHT GOLDFISH FROM THE STORE. THEY WERE INTERESTED IN THE WAY THE FISH SWAM AROUND THE AQUARIUM AND THE BOYS OFTEN SAT DOWN ON THE CHAIR NEARBY AND WATCHED THEM.

ONE SUNNY AFTERNOON WHEN THE WEATHER WAS HOT JIM NOTICED THAT THE FISH WERE SWIMMING VIGOROUSLY AROUND AND BREATHING RAPIDLY, THEIR MOUTHS AND GILLS OPENING AND CLOSING AT A RAPID RATE.

HE CALLED BILL TO LOOK AT THEM. BILL WAS AMAZED. HE HAD WATCHED THEM JUST BEFORE GOING OUT ON HIS PAPER ROUTE WHEN IT WAS DARK AND THE WEATHER WAS COOL. AT THAT TIME, THE FISH WERE SWIMMING SLOWLY AROUND AND BREATHING AT A MUCH SLOWER RATE.

WHAT MIGHT HAVE MADE THE DIFFERENCE IN THE BREATHING RATE OF THE FISH? THE BOYS DECIDED THEY WOULD TRY TO SOLVE THIS MYSTERY.

CAN YOU HELP THEM?

READ THE STORY OVER AGAIN TO LOOK FOR CLUES AND THEN MAKE SOME HYPOTHESES.

WRITE DOWN THREE HYPOTHESES YOU MIGHT MAKE BASED ON THE INFORMATION GIVEN.

HYPOTHESES: 1._____

NAME_____

DATE_____

GETTING TO KNOW THE GOLDFISH - TASK CARD #5 (CONT.)

THE GOLDFISH MYSTERY

HYPOTHESES (CONT.)

2._____

3._____

DID YOU INCLUDE THESE IN YOUR LISTING?

1. THE WARMER THE WATER THE FASTER THE BREATHING RATE (OR THE OPPOSITE).
2. THE GREATER THE AMOUNT OF LIGHT THE FASTER THE BREATHING RATE (OR THE OPPOSITE).
3. THE HUNGRIER THE FISH THE MORE RAPID THE BREATHING RATE. (THE STORY DOESN'T GIVE A CLUE AS TO WHEN THE FISH WERE FED, BUT THE HYPOTHESIS MIGHT BE TESTED.)

CHOOSE ONE HYPOTHESIS. WRITE IT DOWN AND MAKE A PLAN TO TEST IT.

CHECK YOUR PLAN WITH YOUR TEACHER. BE SURE YOU CAN ANSWER THESE QUESTIONS:

- HOW WILL YOU KNOW THAT THE FACTOR YOU ARE TESTING (WATER TEMPERATURE OR LIGHT) CHANGES?
- CAN YOU MEASURE HOW MUCH CHANGE IS TAKING PLACE?
- WHAT FACTORS WILL YOU NEED TO CONTROL?
  HINT: USE THE SAME FISH EACH TIME IN THE SAME AQUARIUM WITH THE SAME AMOUNT OF WATER.
- HOW OFTEN WILL YOU COUNT THE GILL BEATS? YOU MIGHT COUNT GILL BEATS PER 15 SECONDS TO GET THE BREATHING RATE.
- HOW CAN YOU GRAPH YOUR FINDINGS?

IF YOU NEED HELP IN SETTING UP THE EXPERIMENT USE THE NEXT TWO PAGES, BUT ONLY IF YOU NEED HELP.

NAME_____

DATE_____

GETTING TO KNOW THE GOLDFISH - TASK CARD #5 (CONT.)

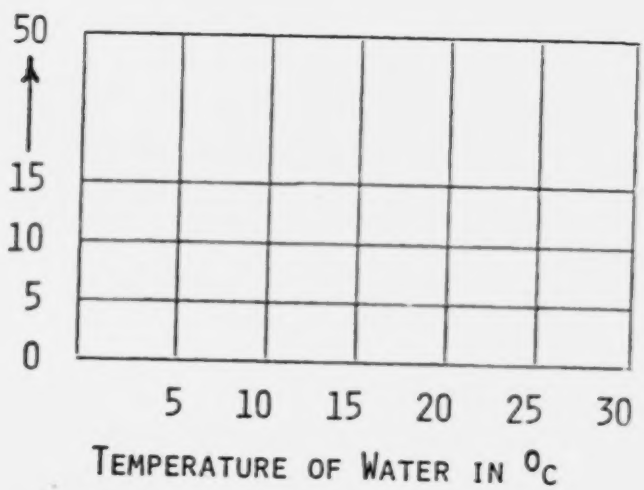
THE GOLDFISH MYSTERY

*DOES TEMPERATURE MAKE A DIFFERENCE?

TO TEST WHETHER WATER TEMPERATURE WILL MAKE A DIFFERENCE IN GILL COVER BEATS YOU MIGHT LOWER THE TEMPERATURE OF WATER BY ADDING ICE CUBES ONE AT A TIME. AT EVERY 5 OR 10 DEGREE CHANGE IN TEMPERATURE THE NUMBER OF GILL COVER BEATS PER 15 SECONDS SHOULD BE RECORDED. THESE FINDINGS SHOULD BE LISTED ON A CHART AND THEN TRANSFERRED TO A GRAPH.

WATER TEMPERATURE IN DEGREES C	GILL COVER BEATS PER 15 SECONDS

GRAPH YOUR RESULTS.



GETTING TO KNOW THE GOLDFISH - TASK CARD #5 (CONT.)

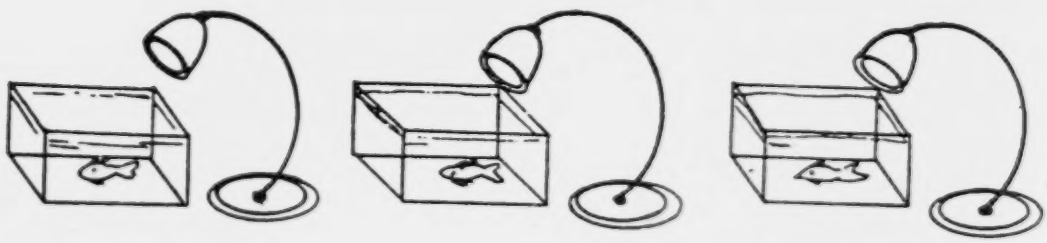
THE GOLDFISH MYSTERY

MAKE PREDICTIONS ON THE BASIS OF YOUR GRAPHED DATA. DRAW A LINE BETWEEN THE PLOTTED POINTS. EXTEND THE LINE OUTSIDE THE RANGE OF THE COLLECTED DATA AND MAKE PREDICTIONS ON THE BASIS OF THIS LINE EXTENSION. IF POSSIBLE, CHECK YOUR PREDICTION.

* DOES LIGHT MAKE A DIFFERENCE?

YOU MAY CHECK THIS BY COVERING ONE TANK COMPLETELY AND LEAVING THE SECOND ONE OPEN TO THE LIGHT. MAKE A "PEAK HOLE" IN THE DARK TANK AND TRY TO MEASURE THE GILL COVER BEATS. SOMETIMES THIS IS HARD TO DO.

TO BE MORE EXACT YOU MIGHT CHANGE THE LIGHT INTENSITY BY USING DIFFERENT LIGHT BULBS: A 15 WATT, A 60 WATT, AND A 100 WATT BULB. THESE HAVE TO BE PLACED FAR ENOUGH AWAY SO THAT HEAT IS NOT INVOLVED. YOU MIGHT MAKE A SET-UP LIKE THIS.



THE SAME FISH MIGHT BE USED FOR EACH SET-UP. YOU SHOULD ALSO USE THE SAME AQUARIUM, THE SAME AMOUNT OF WATER, ETC.. THE MANIPULATED VARIABLE WOULD BE THE AMOUNT OF LIGHT.

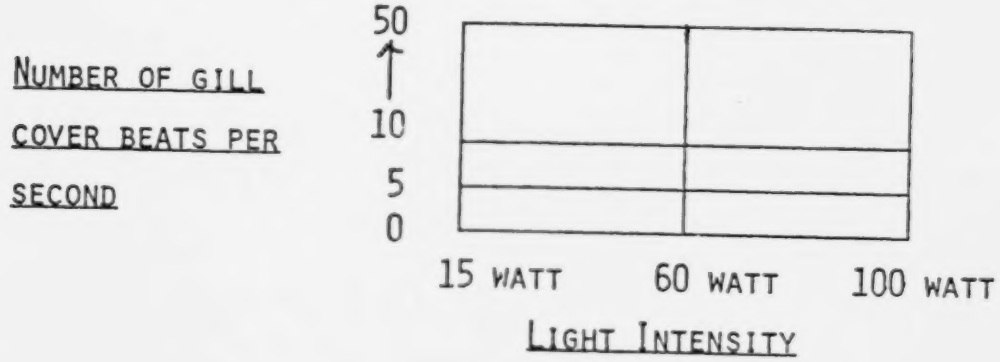
NAME_____

DATE_____

GETTING TO KNOW THE GOLDFISH - TASK CARD #5 (CONT.)

THE GOLDFISH MYSTERY

IN THIS CASE, THE GRAPH MIGHT LOOK LIKE THIS:

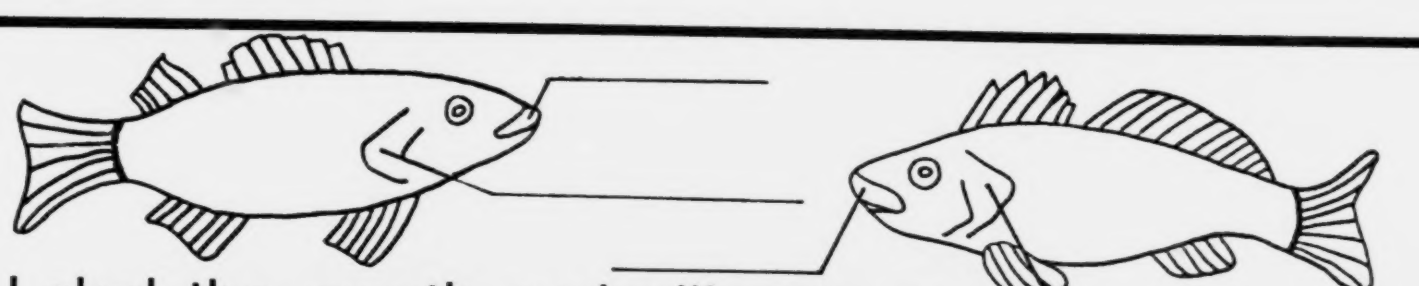


_____

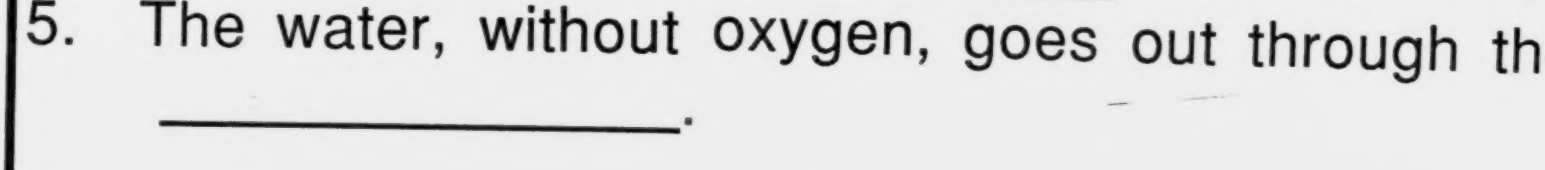
TEACHER APPROVAL

* ADAPTED FROM RASMUSSEN, HOLOBINKO AND SHOWALTER, MAN AND THE ENVIRONMENT. HOUGHTON, MIFFLIN CO., 1974.

From Dora Dean, former Science Supervisor, Lakewood Public Schools, and Project Challenge, Rocky River Public Schools



1. Label the mouth and gill covers.
2. Fish need _____.
3. As a fish swallows, water passes through the _____.
4. The gills strain the _____ from the water.
5. The water, without oxygen, goes out through the _____.



There is a gill cover on each side. Under each are 4 gills.

GETTING TO KNOW THE GOLDFISH - TASK CARD #6

On Your Own

- If you can get a different kind of fish, repeat the feeding experiment with it. Does it have the same feeding habits as the goldfish? Compare.
- If you have a tank with no metal on it you might consider the possibility of setting up a salt water aquarium with animals such as sea anemones, coral and salt water fish.
- Next time you go fishing or have a whole fish for dinner, take the opportunity to examine the fish closely. Look at the eyes. Raise the gill covers and find the gills underneath. Find the little holes in the nose which lead to the organs of smell. Can you feel the small bones in the fins?
- Read to find out what happens to fish that live outside when the weather gets cold. Explain why they are classed as cold-blooded animals.
- Visit an aquarium to view some very unusual fish. Can you find a walking fish? Why is this important in the evolution of animals?
- Read about fish that are on the endangered species list.
- The fishing industry is the backbone of some countries such as Iceland. Find other areas in the world where much of the population depends on fishing as a livelihood.

No teacher approval is needed.

From Dora Dean, former Science Supervisor, Lakewood Public Schools, and Project Challenge, Rocky RIver Public Schools

To Know a Goldfish

On your own

- "Fish are well adapted to life in the water." Demonstrate this by giving ten facts about fish to support this statement.

- All living things need oxygen. Why do most fish die in the air even though the air contains more oxygen than the water?

- After you have had a fish dinner, collect the bones from one fish and glue them in place on a piece of cardboard. Compare these with the bones of a person. What similarities can you find?

- Find the vertebrae. Some of the paired fins are homologous (having the same relative position or function) to the limbs of other vertebrates.

    - pectoral fins like front legs
    - pelvic fins correspond to hind legs

- Many fish have a color pattern known as countershading. This pattern is a type of camouflage. Visit an aquarium to look for this. Where is the light? Where is the dark? How might countershading be a help to a fish?

- Scales on a fish grow bigger as the fish gets bigger but they always stay the same in number. By counting the concentric rings on a scale you can tell the age of the fish. See if you can find some scales to examine under a hand lens. How old is the fish?

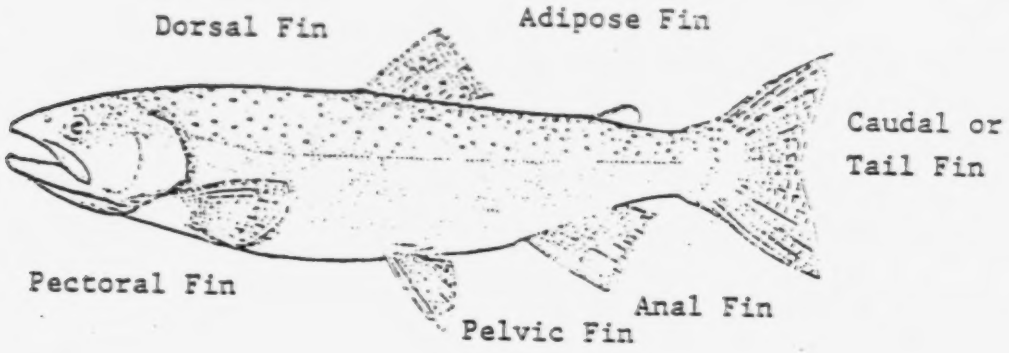
- At Pacific ports, the Division of Wildlife examines fish brought in by sports fisherman. They count the rings on the scales to find the age of the fish being captured.

From Dora Dean, former Science Supervisor, Lakewood Public Schools, and Project Challenge, Rocky River Public Schools

Name _____

FISH

How many fins do you think a fish has?



1. This fish has _____ fins.

Each fin has its own job to do. The fish uses the tail fin or caudal fin for steering and power. The fish uses his pectoral fins like an airplane's wings. These fins control his ups and downs.

2. Which fin do you think he uses to keep himself from rolling over? _____

Compared to many sea animals fish are very fast. Swimming fast helps them catch their food and escape from their enemies.

3. Which fin supplies the power for fast swimming? _____

_____

_____

Name _____

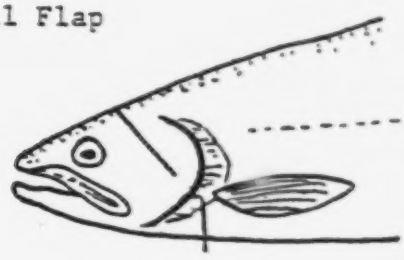
Some fish swim in large groups called <u>schools</u> for protection.

4. How can being in a school give a fish protection?

_____

_____

All animals need <u>oxygen</u> to live. Our <u>lungs</u> take oxygen out of the air. The <u>gills</u> of a fish are used to take oxygen out of the water.



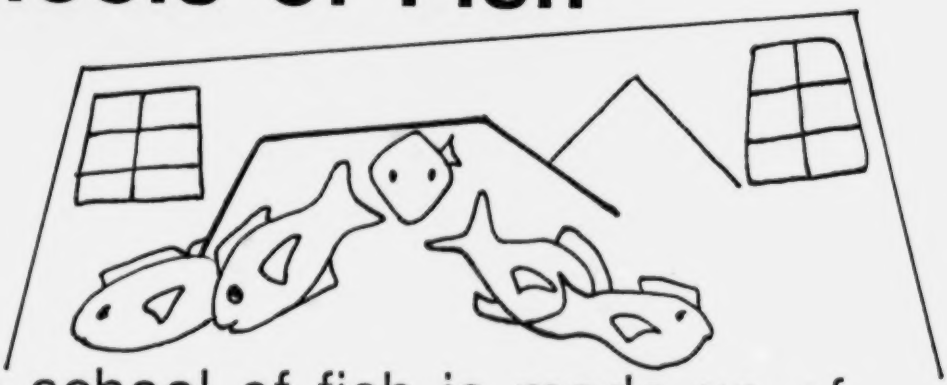
A side view of a fish showing
one of his gills

5. How are gills like lungs?

_____

_____

Schools of Fish



A school of fish is made up of fish of one kind. The fish are all the same size. They always do the same thing at the same time. They behave as ONE instead of many. They swim in the same direction, at the same speed. When one stops to eat, they ALL do!

Why do you think fish swim in schools?

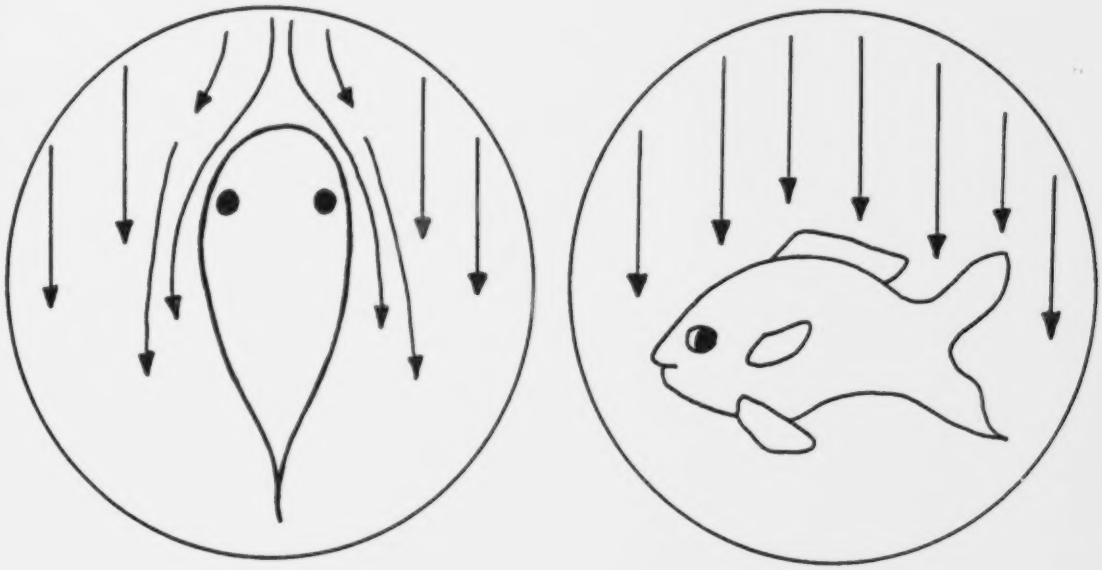
Schooling is safer than swimming alone because:

1. Hundreds of eyes are better than 2 eyes when it comes to seeing food and danger.
2. An enemy is sometimes so confused by the movements of a large school that it cannot attack any one fish.
3. A group of fish close together will not be bothered as much as a group whose fish are spread out in the water.

Read "Swimmy." Which facts did its author use in this book?

Fish and water currents

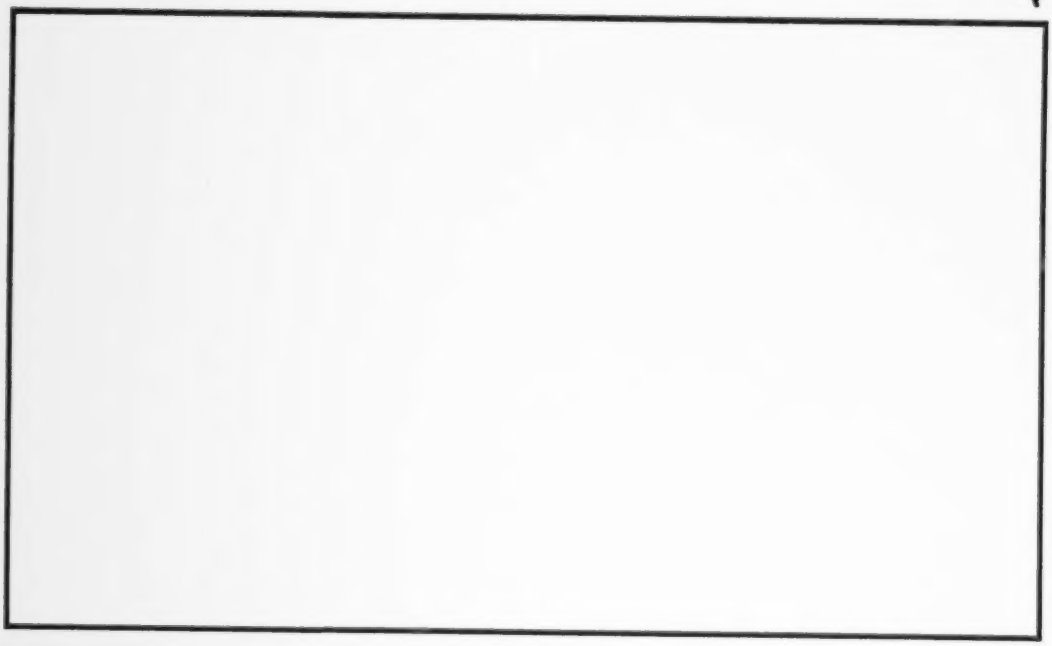
Fish head into the water current. The bodies of fish are shaped like bullets! This body shape offers the least resistance to the current. The water just flows smoothly over it.



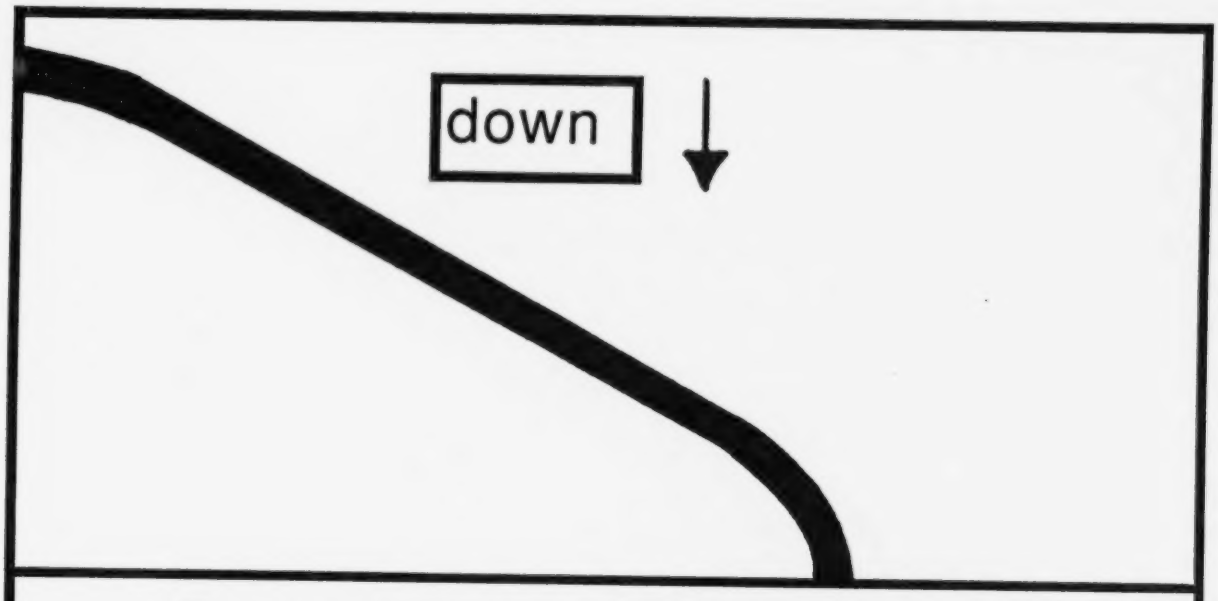
Which circle shows how a fish responds to a current? Color it.

Fish and water currents

If fish did not swim into the current, they would be swept far from their homes and could easily be crushed against rocks.



Draw a picture showing what happened to a fish that did NOT swim into the current.



Draw yourself walking UP a down escalator! Walking up it just fast enough to stay in the same place is pretty much what fish have to do when they fight the current!

Do you think this would be easy? Why or why not?

Name:

Write a story about a fish that did NOT swim into the current. (Give it a happy ending!)

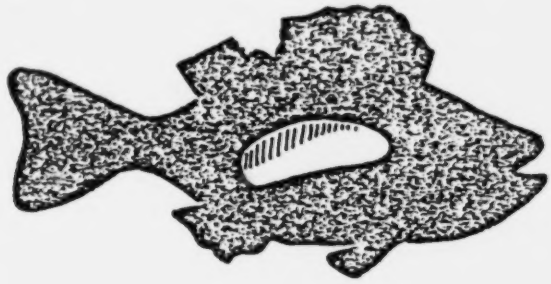
Teacher information sheet:

HOW DO FISHES MAINTAIN WEIGHTLESSNESS ?

If you watch a fish in an aquarium, you will notice that the fish can stay in one place, whether near the top or bottom, without spending much energy. It does not appear to be struggling to overcome a tendency to sink or float; it is weightless.

Most fishes maintain weightlessness in water even though their body substances are denser or heavier than water. They achieve weightlessness in much the same way as other marine organisms.

Most fishes overcome the tendency to sink through an organ called the swim-bladder. The swim-bladder is like an inflatable balloon that lies between the stomach and the backbone. When it is filled with air, the weight of the fish becomes the same as the weight of water occupying an equal volume; the fish becomes weightless, and can stay at any position in the water without exerting itself.



How does a swimbladder work? To find out, you will need a wide-mouthed jar and a plastic medicine bottle with a cap. Fill the jar with water. Now cap the empty medicine bottle and drop it in the jar. It floats because it is filled with air. Remove the bottle and put a little water in it. How well does it float now? Keep adding water gradually until the bottle sinks to the bottom. If you are lucky, at some point you will find the bottle at "neutral buoyancy"-- it will stay near the top or bottom without sinking or floating.

Be sure to point out to your class that the fish does not sink by taking in water but rather by expelling air. Can anyone in your class think of a way to do this demonstration using a balloon?

James Kolb, Marine Science Project: FOR SEA, Marine Science Center, Poulsbo, WA

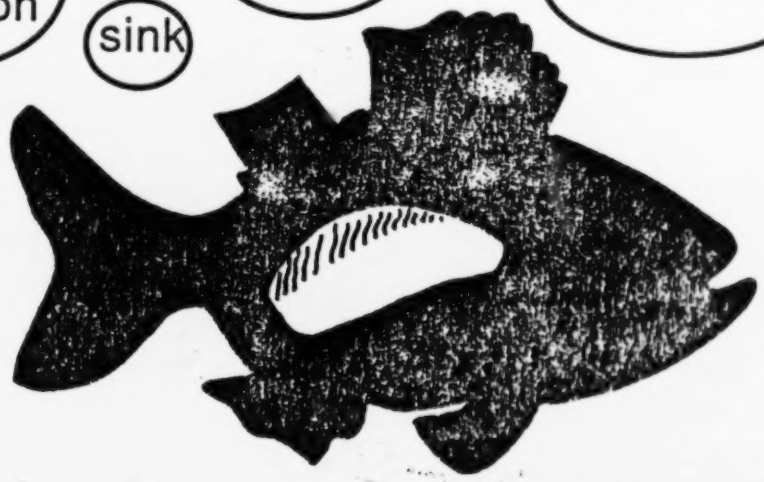
inflatable balloon

backbone

weightless

sink

air



Color the swim bladder red!
Now fill in the blanks below.

1. Fish use a swim bladder to overcome the tendency to _____.
2. The swim bladder is located between the stomach and the _____.
3. The swim bladder is like an _____.
4. The weight of the fish equals the weight of the water when the swim bladder is filled with _____.
5. A fish stays in one place easily because the swim bladder helps it become _____.

Body Parts and Their Functions

Directions: Cut apart these body parts and their functions. Correctly match them and glue or tape them to another sheet of paper.

Body Parts	Functions
gills	pumps blood through the body
gonad	digests food
swim or gas bladder	stores blood and filters out poisons from the blood
kidney	produces eggs or sperm
heart	carries food from mouth to stomach
liver	remove waste from the body
spleen	provides body support and protects the spinal cord
stomach	carries messages from the brain to other parts of the body
esophagus	controls the fish's activities
spinal cord	absorbs oxygen from the water, gathers food from the water
brain	maintains buoyancy, regulates pressure by releasing or absorbing gas
backbone	breaks down red blood cells

IDEA GUIDE FOR TEACHERS:

BROMTHYMOL BLUE

CARBON DIOXIDE EXPERIMENT

Purpose: This experiment will demonstrate that carbon dioxide is important even though it can't be seen. The fish breathes out carbon dioxide just like we do.

Materials needed: Bromthymol Blue, (get at any science supply store) straws, plastic cups.

Procedure: This experiment can be done with an entire class or with a few selected students.

1. Put one teaspoon of bromthymol blue in a plastic cup. Add water until it is 1/3 full.
2. Give each student a straw.
3. Each student is to blow out carbon dioxide into water through the straw.
4. Watch what happens to the water. It turns green.
5. Discuss the change and what caused this to happen.

Variables:

1. Add differing amounts of bromthymol blue and see if the resulting color varies.
2. See if a petite person and a big person get the same results.
3. Determine if boys blew out more carbon dioxide than girls.
4. Fill the cups with different heights of water and brothymol blue. Time how long it takes for the water to change color.
5. Graph the results in terms of time and color.
6. Use a plastic bag instead of a plastic cup. See if there is a time difference and a color difference.
7. See if it is possible to merely blow into the bag or cup without using a straw and still produce a color change.
8. Try blue food coloring instead of the chemical brothymol blue. Check results. Why?

* The developers have never had a child suck in the brothymol blue. However, instruct the children to blow out through the straw - not to suck in. This activity has been used with first graders through fifth.

The Six Senses of Fish

Aquatic animals have senses adapted for seeing, hearing, feeling, tasting and smelling in the water, as well as the remarkable lateral line of fishes.

SEEING

Fish have no necks so they cannot turn their heads. Their large round eyes protrude from the sides of their heads giving them a wider field of vision. Have you ever seen a picture taken with a wide angle "fish eye" camera lens? If so you know how much more can be seen at one time than with a common flat camera lens (which is much like your eye). The no neck problem has been solved by crustaceans (lobster, crabs and shrimp) by having their eyes on moveable stalks.

HEARING

Man has called the oceans the "silent sea," because his ears are not adapted to hearing very well in the water. The sea is anything but silent. Sound travels very well in water (almost 5 times faster than in air) and marine animals have many ways of making sounds. Most marine animals have highly sensitive hearing. Man has had to construct hydrophones and sonar receivers to hear as well. Some fish, like the electric eel, use electrical impulses (much like sonar) to locate their food.

FEELING, TOUCHING AND TASTING

Fish have a unique device called a lateral line. This is a row of sensory nerves along each side of their bodies which are sensitive to movement and pressure changes in the water around them. Sightless fish that live in dark underground caves depend on these lateral lines to find food and to navigate.

Many bottom dwellers which have hard shells, protective spines or tentacles have no need for eyes, but use their sense of touch to find food. The tentacles of anemones and the tube feet of starfish and sea urchins are used to sense food.

The catfish which feeds on the bottom has eyes to watch for predators, but feels for his food with his whisker-like chin barbs that are sensitive to touch, and are also covered with taste buds.

SMELLING

Many predators, like sharks and eels, use their sense of smell to locate food. Salmon are thought to be able to find their way across hundreds of miles of open ocean to their home streams by means of this sense.

WHEN YOU VISIT SEA WORLD—Can you find the lateral line on a pork fish? Observe how the electric eel uses its hearing to find food. Watch how the anemone responds with its tentacles to edible and inedible objects.

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Adaptations for Survival

The animals that live in the oceans of the world have evolved through thousands of years, so that they are specifically adapted for survival in their own particular eco-niches in a water environment. These adaptations enable them to successfully survive and reproduce; to eat and avoid being eaten.

MARINE MAMMAL ADAPTATIONS

Students will first learn how marine mammals have evolved special adaptations for living all or part of their lives in the water. Their bodies have become adapted for:

Breathing: They instinctively hold their breath and are able to remain submerged for relatively long periods of time. Some breathe through a blowhole located on the top of the head.

Swimming: They have streamlined shapes, and appendages that have developed into fins, flippers and flukes. Their bodies have a layer of blubber which gives them buoyancy and acts as insulation.

Sensing: Their sense of hearing has become highly specialized for use in the water, where sound travels almost 5 times faster than in the air. With their sense of touch, they can detect movements and changes of water pressure, which may be important indicators of food or danger.

ADAPTATIONS OF FISH AND AQUATIC INVERTEBRATES

Where marine mammals have had to re-adapt to a water environment, fish and aquatic invertebrates have evolved directly in the water. Most have gills instead of lungs and can take oxygen directly from the water. Since their body temperatures are the same as the surrounding water ("cold-blooded" animals as compared to "warm-blooded" mammals), they do not require special adaptations to regulate their internal temperatures.

In the endless food cycle of the sea, in order to obtain food and avoid being eaten, these aquatic animals have also had to evolve many special physical adaptations of color, body form and sensory organs.

SOCIAL ADAPTATIONS

Not only have the marine mammals, fish and invertebrates evolved special physical adaptations in order to survive, but also special social adaptations—ways of associating with their own kind, or with others different from themselves, for obtaining food, protection and insuring reproduction.

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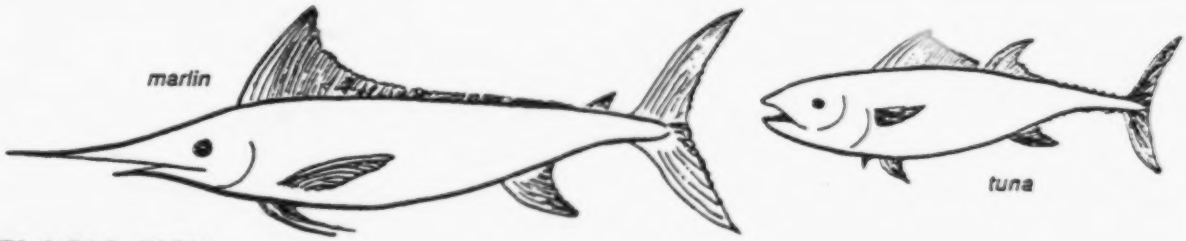
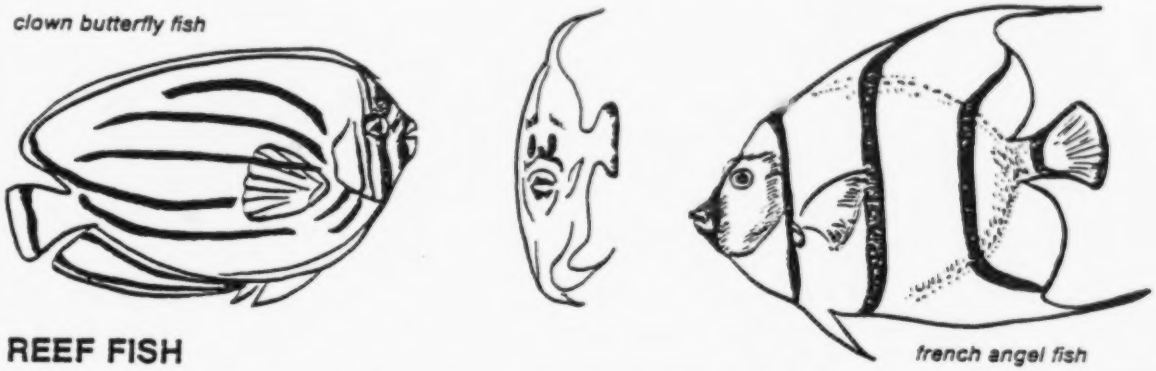
Adaptations for Locomotion

Aquatic animals have evolved distinctive shapes and swimming appendages for efficient locomotion in their environments.



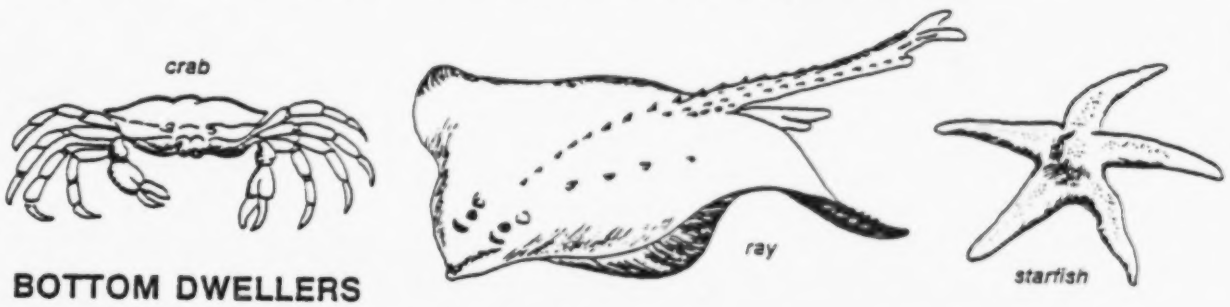
PELAGIC FISH

Streamlined "torpedo-shaped" bodies with wide spread "V" or sickle shaped tails, and narrow streamlined fins are adaptations of the fast swimming fish of the open oceans.



REEF FISH

Fish which must be able to maneuver between the coral heads, rocks and plants of their homes usually have bodies flattened from side to side (laterally compressed), with short fan-shaped tails and fins for abrupt, stop and start, darting movements.



BOTTOM DWELLERS

For swimming, undulating or crawling along the bottom, these aquatic animals usually have bodies flattened from top to bottom (dorsal-ventrally depressed). These flat shapes are particularly helpful to animals living in tide pools. Why?

WHEN YOU VISIT SEA WORLD—Can you determine where the fish live by their shapes? How do reef fish use their fins to hover in one spot? Look at the flat fish. It started life as a compressed fish swimming upright, but now lives on the bottom. How has it adapted?

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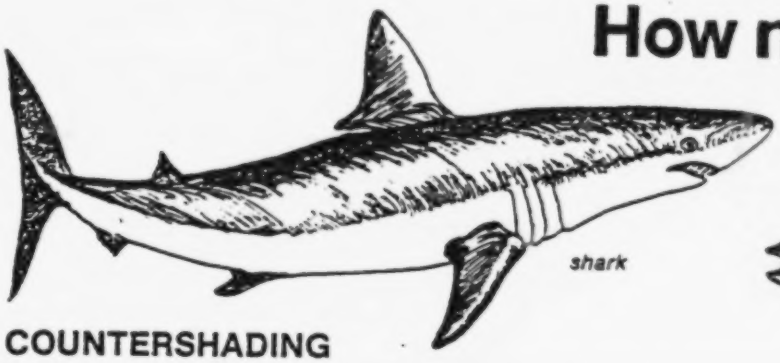
Protective Color and Shape Adaptations

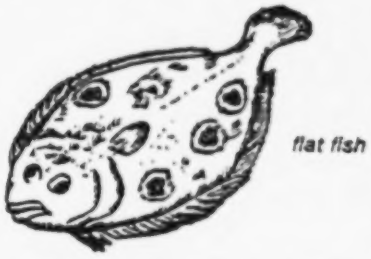
To avoid being seen is an important part of survival for many aquatic animals.

How not to be seen



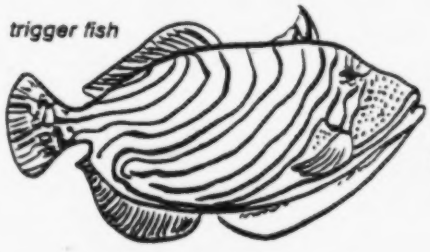
COUNTERSHADING

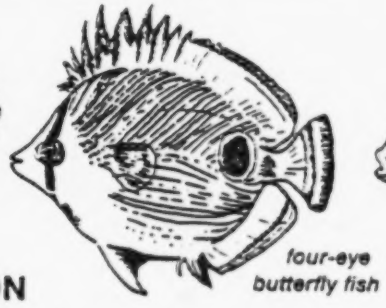
Pelagic fish which live in the open ocean are darker on the top (making them difficult to see from above against the darker water), and are lighter on the bottom (making them difficult to see from below against the lighter surface).

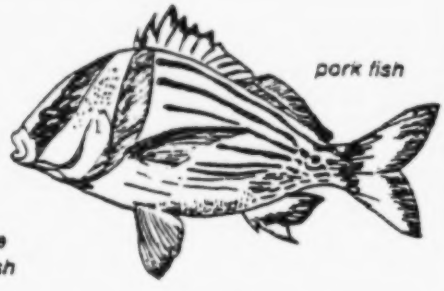


CAMOUFLAGE

Many marine animals are adapted to blend with their surroundings, both in shape and color, and some can even change their color, like the octopus and the flat fish.







DISRUPTIVE COLORATION

Many fish that live in the changing lights and shadows of the shallow waters of reefs have lines or spots which disguise their body shapes and hide the distinctive round shape of their vulnerable eyes. Some even have false eyespots on the rear portions of their bodies to fool predators into thinking they are coming when they are really going.

WHEN YOU VISIT SEA WORLD—Look for false eye spots on fish. How many stone fish can you find? Some fish like the Garabaldi are brightly colored with no disruptive markings. They do not try to camouflage themselves. Can you find out why?

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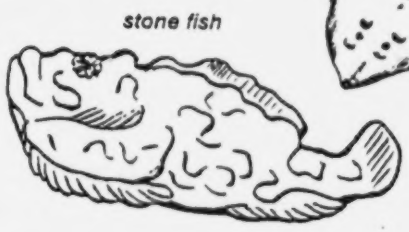
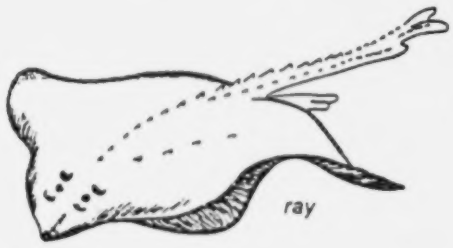
Helpful Appendages

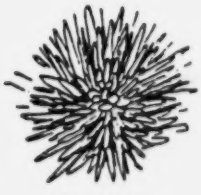
lion fish


stone fish

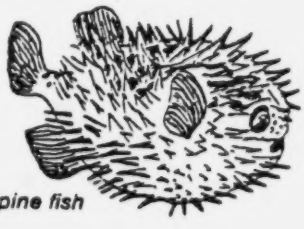

ray

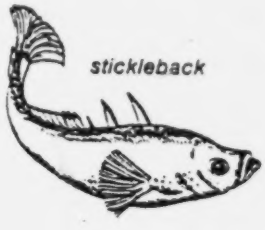
SPINES FOR PROTECTION

Many fish, which are not fast swimmers, have sharp or poisonous spines for protection. The lion fish, scorpion fish and stone fish have venomous dorsal spines along their backs. Stingrays have a poisonous dart on their tail.


sea urchin

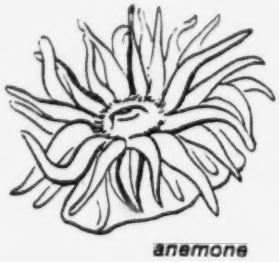
starfish

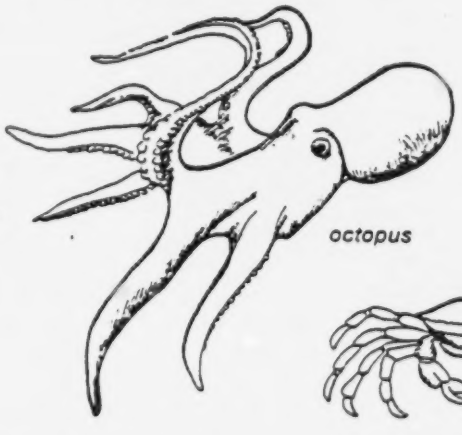

porcupine fish

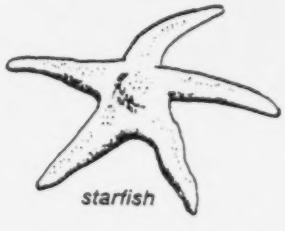

stickleback

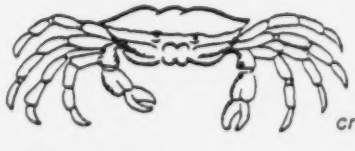
Some sea urchins and starfish have their upper surfaces protected by sharp spines. The stickleback and triggerfish have dorsal spines they can erect and lock in place to keep from being swallowed. The porcupine fish is also covered with spines which it erects by inflating itself like a balloon.

jelly fish


anemone


octopus


starfish


crab

ARMS AND TENTACLES FOR CATCHING AND HOLDING

Some sea animals, like starfish and octopus have arms equipped with suction tubes or discs for catching and tenaciously holding their food. Some lobsters, crabs and shrimp have pinching claws on the ends of their appendages. Jelly fish and sea anemones have tentacles equipped with stinging cells to catch their food.

WHEN YOU VISIT SEA WORLD—Which are the three most poisonous fish? How would a starfish use its arms to open a tightly closed clam shell?

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TEACHER BACKGROUND - Nature's Protection

"Nature's" Protection" takes the concept of interrelationships stressed in the section "Plants and Animals Depend on Each Other" one step further. Plants and animals not only act in a cooperative fashion, they also interact in predator-prey relationships. It is important to stress that the relationships which exist maintain the stability of the world of life. As we simplify ecosystems by removing links in the food chains, we increase the chance of dramatic and drastic change within those systems.

This section deals with nature's way of keeping a balanced system. Some animals eat plants which, in turn, are eaten by other animals. Man plays a complicated role, for he is a harvester and sometimes, sadly enough, a depleter. Wise harvesting cultivates a crop while unwise use often eliminates it.

To help maintain nature's balance, each plant and animal has some means of protection to insure the continuance of the species. It may be a protective covering of shell or the ability to dig down into the bottom. It may be that the animal is capable of moving or swimming very fast and is thus able to outrun its predators. Some animals and plants maintain the species by reproducing in large numbers. Most of the young eventually are eaten or die. A few survive which keep the cycle going.

In this section "plankton" is again defined. Plankton are those forms of plant and animal life that drift, depending upon the currents for locomotion. They are the free floating microscopic plants and animals that, among other things, are responsible for the colors of the sea. When you see clear blue water it indicates an ocean desert, or the lack of planktonic life. A very simple yet accurate definition of plankton is any form of dirfting plant or animal life in the sea, regardless of size.

Duplicate the pages of the text. One set is recommended per student. The basic concepts covered in the reading need to be discussed by the teacher. Continue to be aware of new vocabulary and teach the "Key Words" if they are unfamiliar to your students. The activities included are designed to reinforce the concepts introduced. Coloring worksheets follow this "Teacher Background" section. They are for reinforcement. They should be used after the text has been studied.

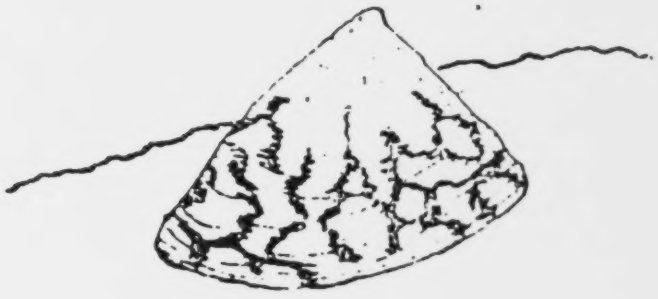
KEY - Text questions

1. Animals protect themselves:
   a. with pinchers
   b. by changing color
   c. with stingers
   d. by looking like something they are not
   e. with shells
   f. by moving fast
2. Some eggs live because mother animals lay ____many____ eggs
3. Plankton move by ____drifting____.

Name _____

NATURE'S PROTECTION

Many plants and animals become food for other animals. All animals have ways to protect themselves. Some animals protect themselves with pinchers. Others change their color. Some use a stinger to keep their enemies away. Other animals look like something they are not. A limpet can look like a pebble. A sea anemone sometimes looks like a stump.



Limpets can look like rocks.

Many animals use shells for protection. The clam, oyster and the hermit crab are just a few.

Hermit crab ready to defend itself

Name _____

Other animals can move very fast. It is hard for their enemies to catch them.

1. List 5 ways animals protect themselves.

   1. _____

   2. _____

   3. _____

   4. _____

   5. _____

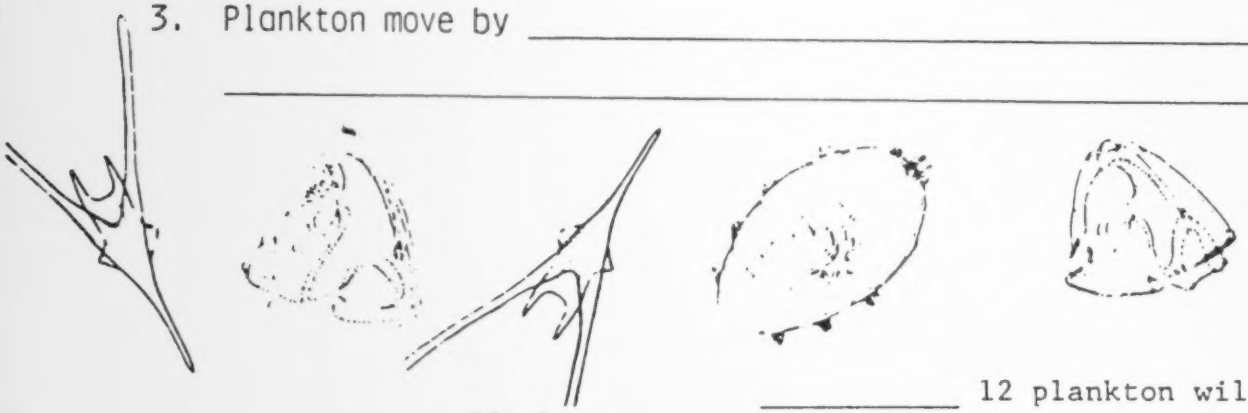
Nature helps marine life survive in other ways. Mother animals will lay many, many eggs. Sometimes these eggs drift in the water. These drifting eggs are called plankton. Many of the eggs are eaten. However, the mother laid many eggs. Some eggs will survive to continue the species.

2. Some eggs live because mother animals lay _____eggs.

Plankton are living plants or animals which can only drift in the water. They can not stop themselves. They can not decide where they will go.

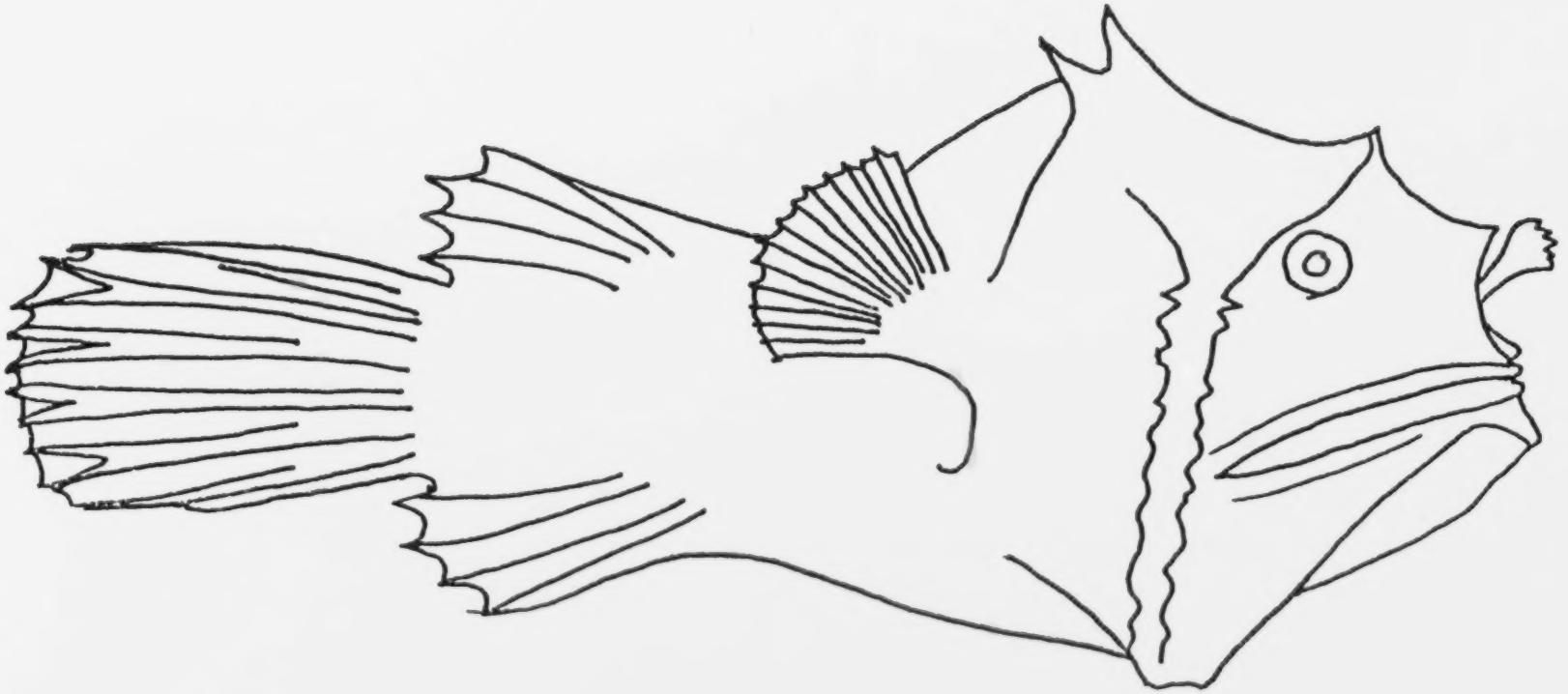
3. Plankton move by _____

_____.



Plankton

_____ 12 plankton will fit on this line.



A STRANGE FISH THAT LIVES ON THE BOTTOM

1. Give this fish a name. "Hi! My name is _____."
2. Color the eye dark blue.
3. Circle the pectoral fin.
4. Color your fish a dark brown color that would help it hide.

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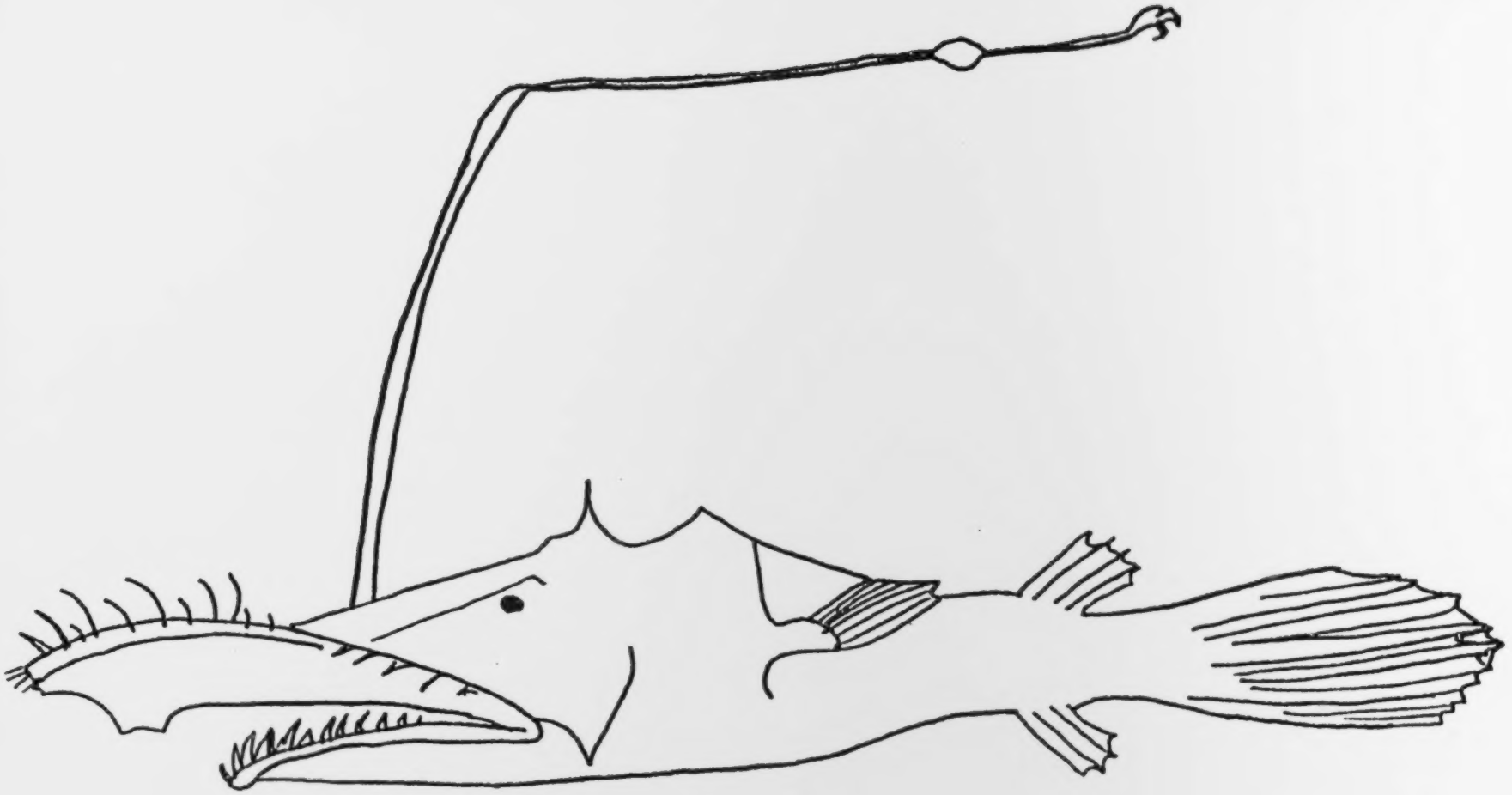
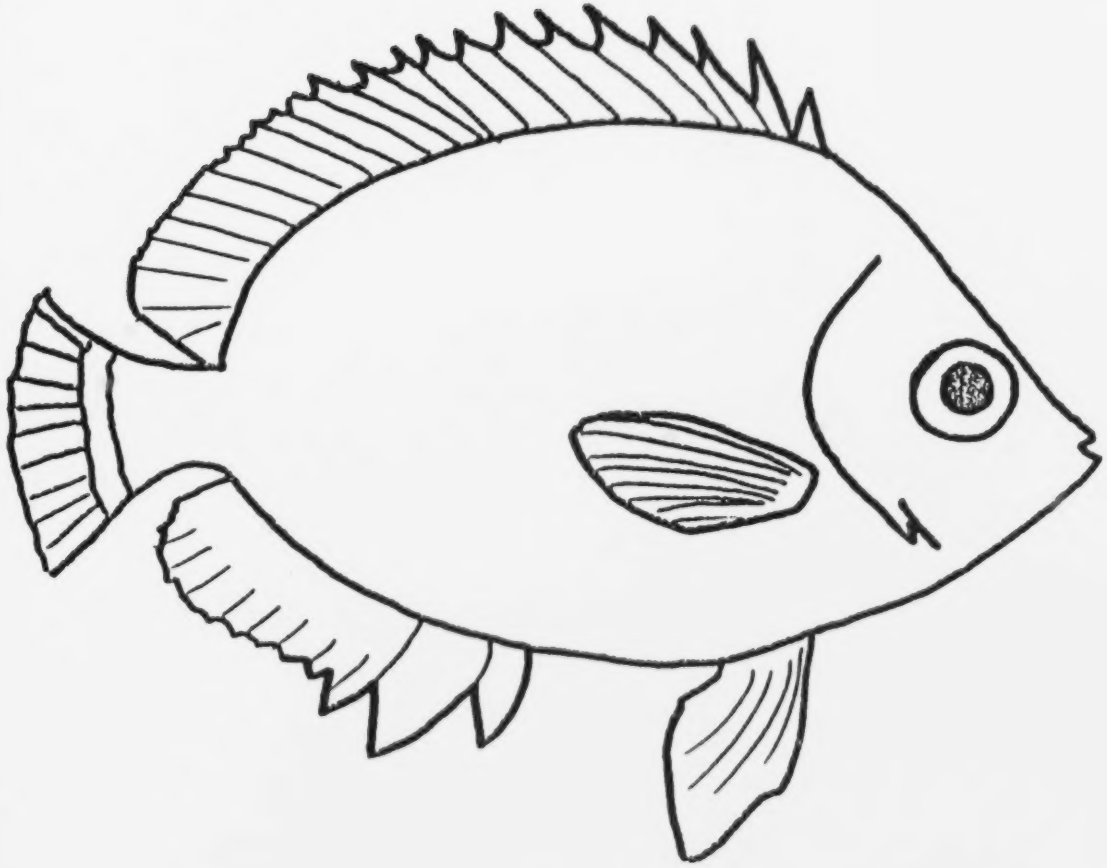
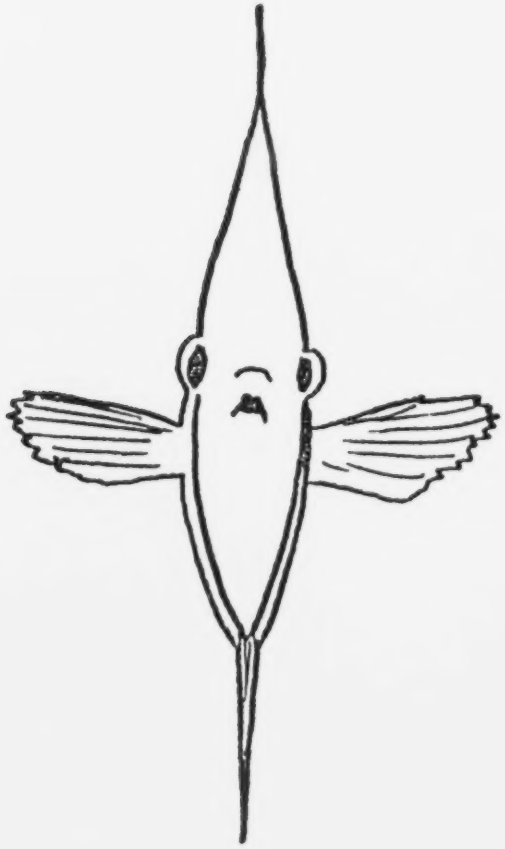


An angler is a fisherman. I'm called an angler fish. Can you guess why?

1. Color my "fishing pole" brown.
2. Draw a red arrow showing the direction of my bottom teeth.
3. Color me so I can hide in the dark ocean bottom.

James Kolb, Marine Science Project: FOR SEA, Marine Science Center, Poulsbo, WA





Now you see me, now you don't!

1. Draw a circle around the way I should face an enemy.
2. Color me so I can hide in the seaweeds.

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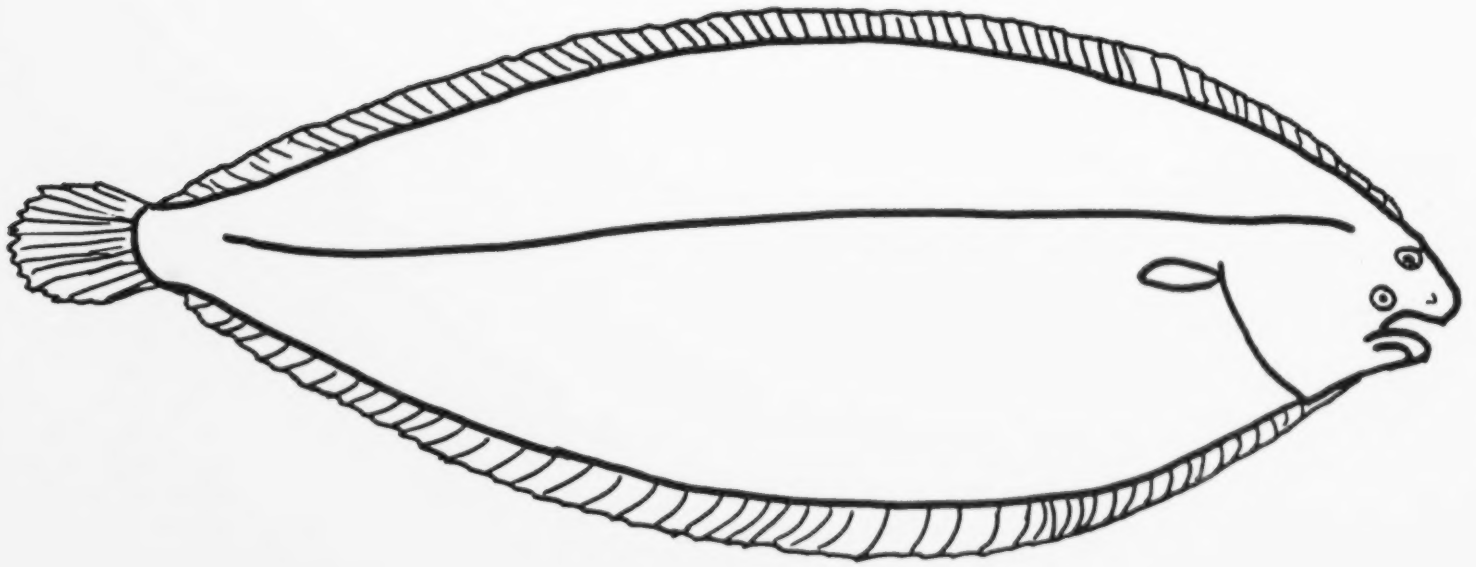
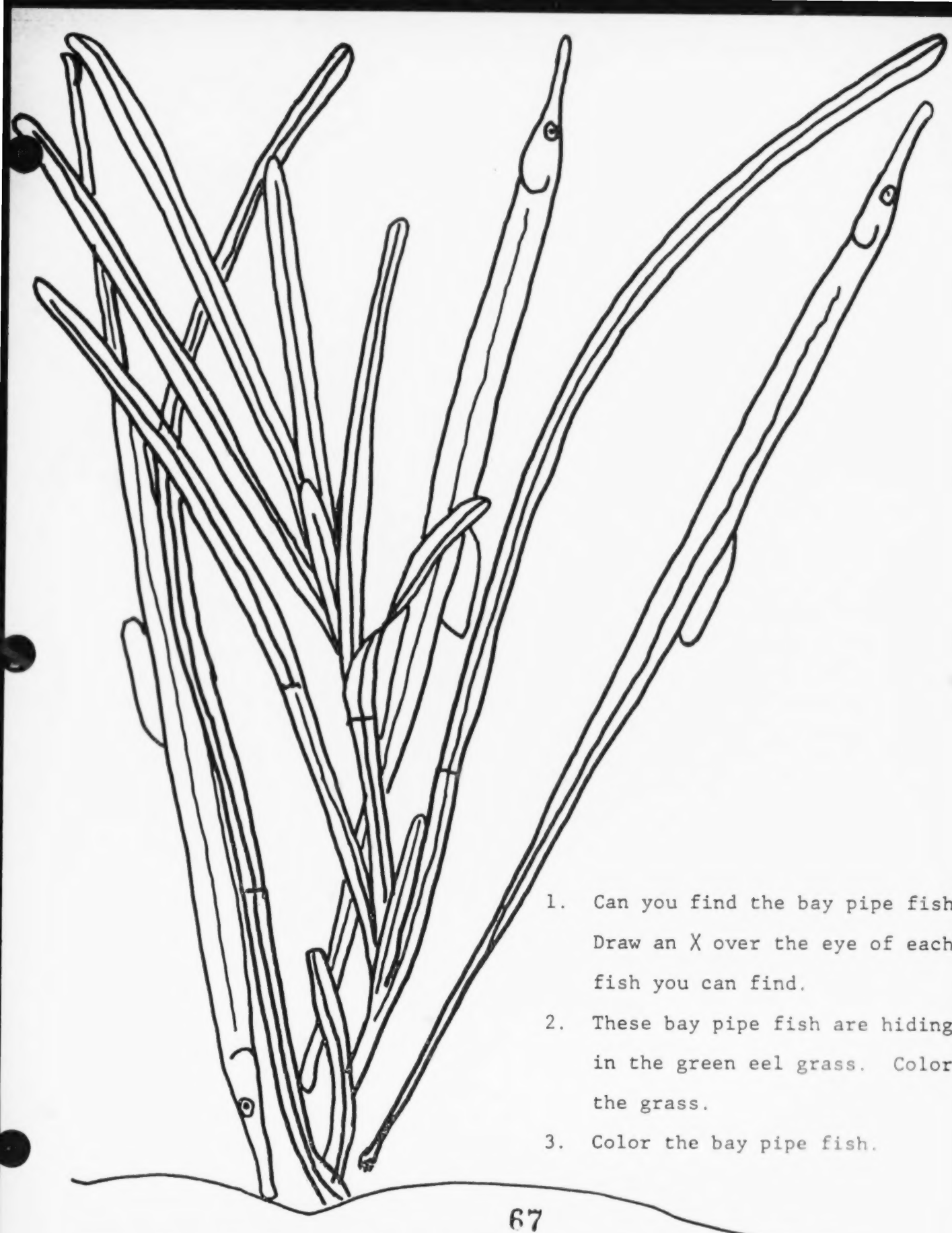


Now you see me,

1. Where in the ocean do you think I live? _____.
2. What color do you think I am? Color me that color.

now I'm lying low!



1. Can you find the bay pipe fish? Draw an X over the eye of each fish you can find.
2. These bay pipe fish are hiding in the green eel grass. Color the grass.
3. Color the bay pipe fish.

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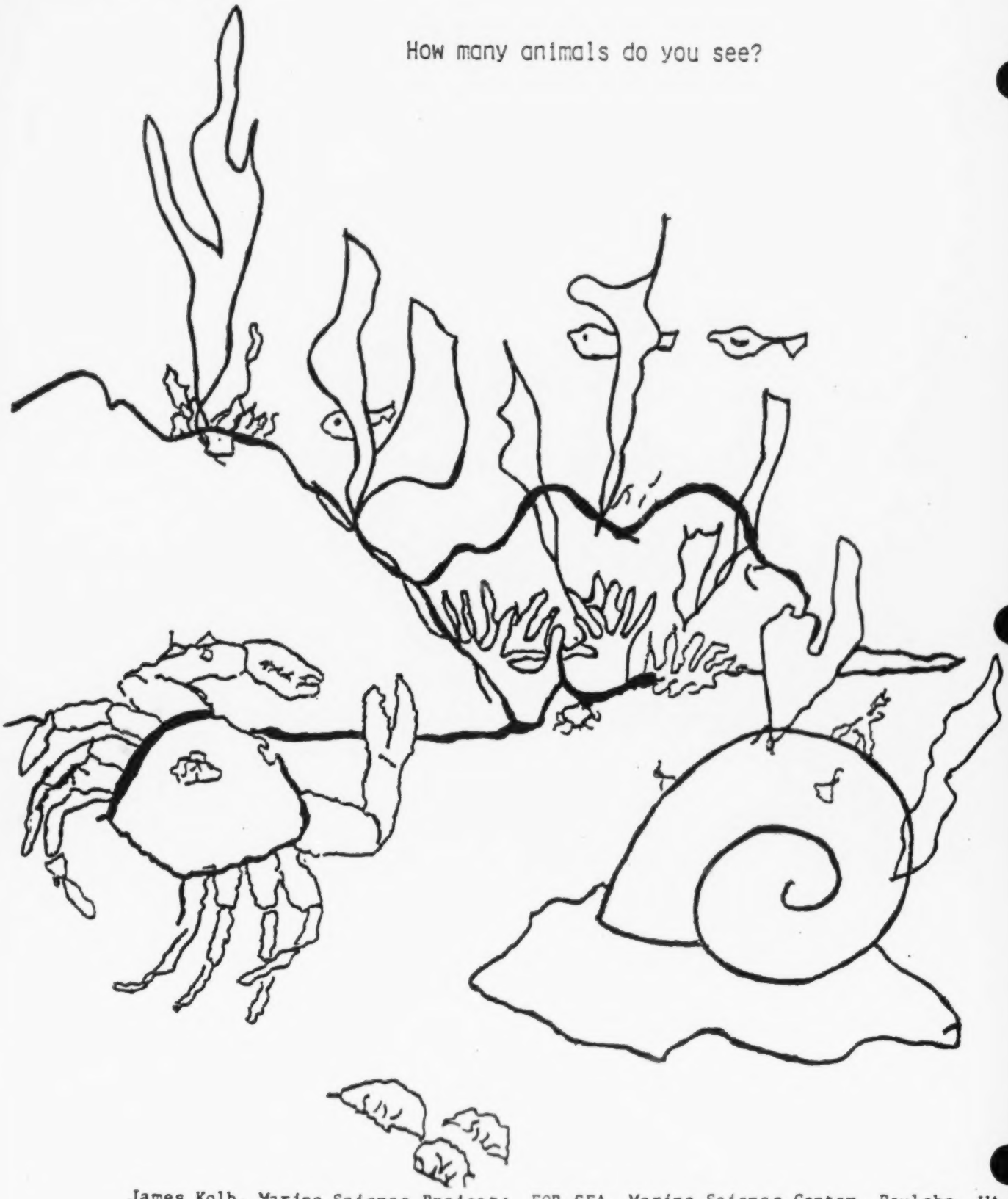
overhead



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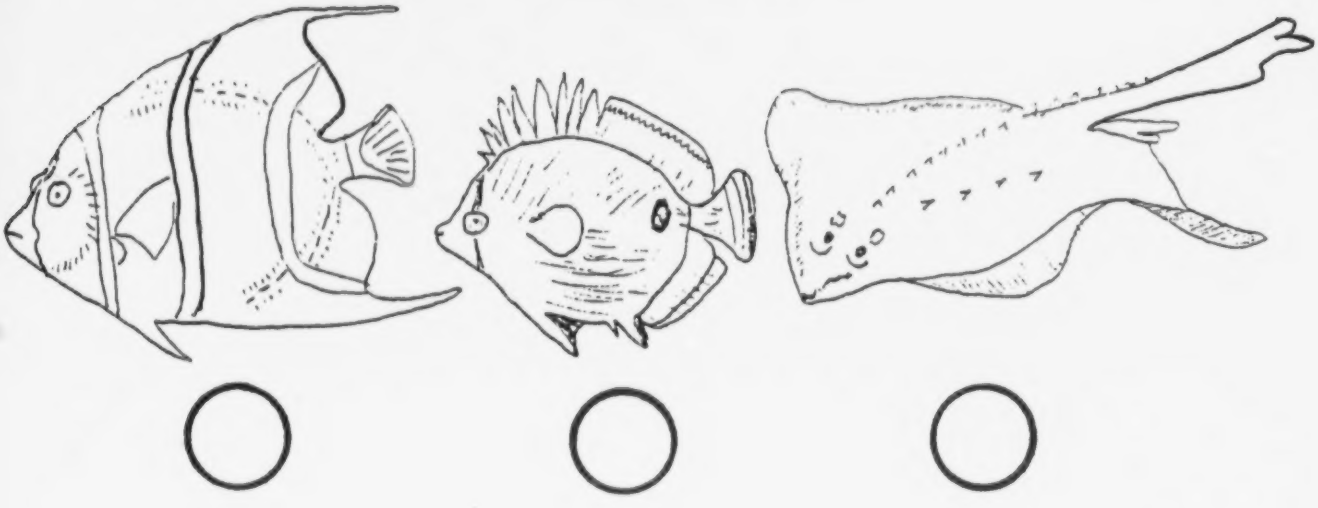
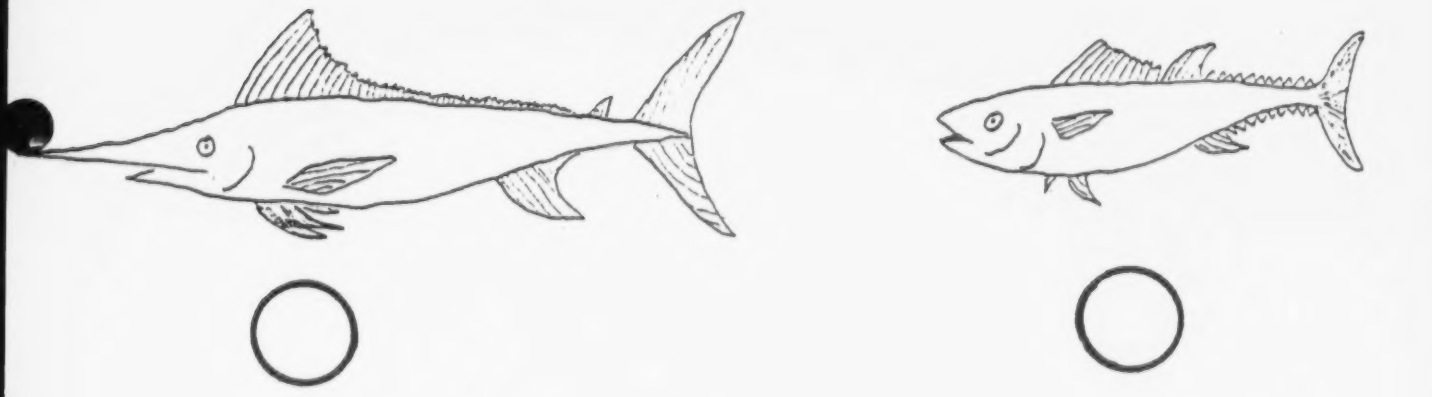
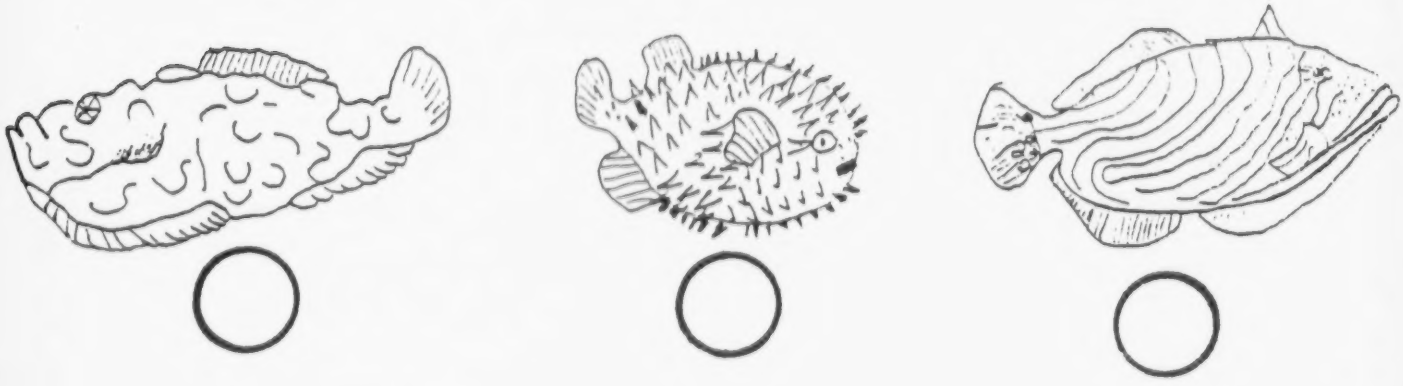
Protection for Fish...

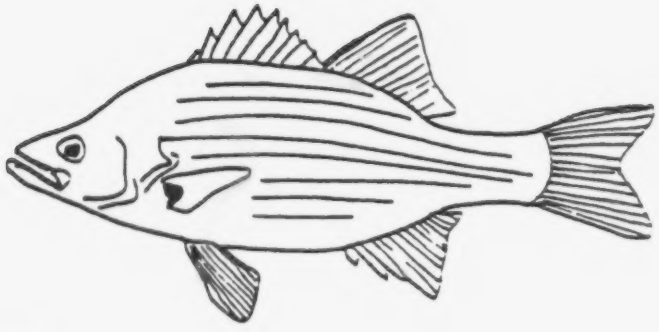


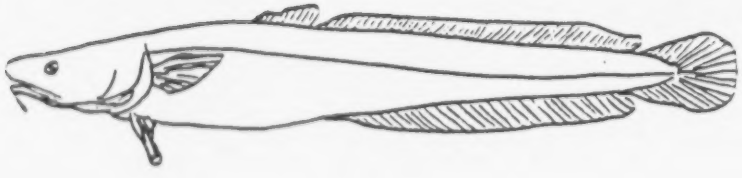


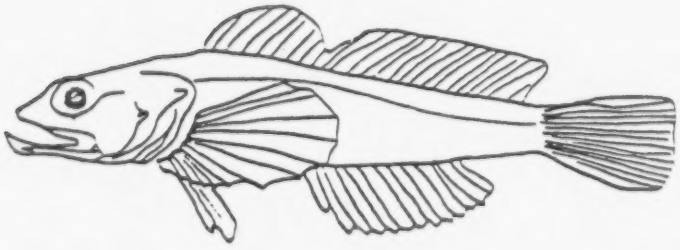


In each circle, put the number indicating means of protection:
1=countershading 2=camouflage 3=lines or spots 4=spines
5=flatness 6=streamlined

PROTECTION FOR LAKE ERIE FISH







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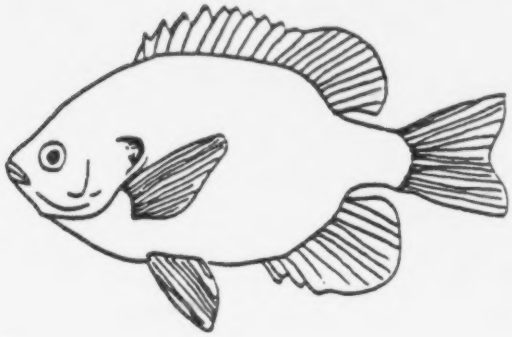
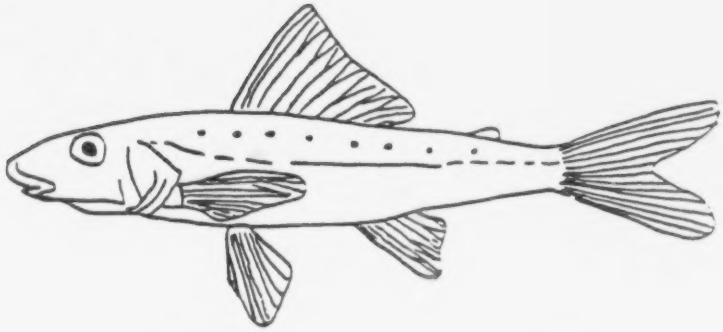
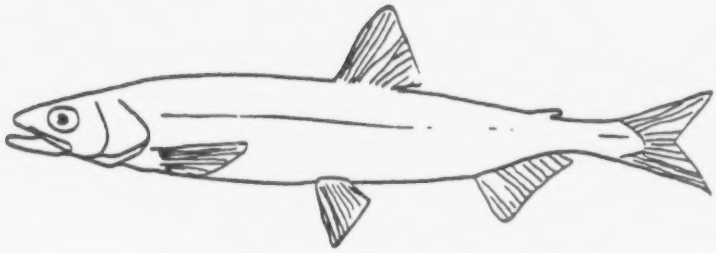
PROTECTION FOR LAKE ERIE FISH







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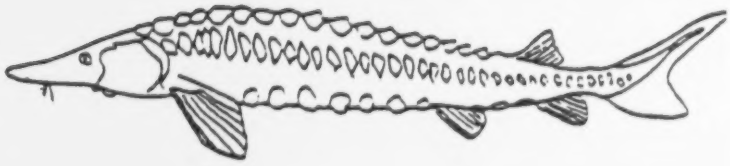
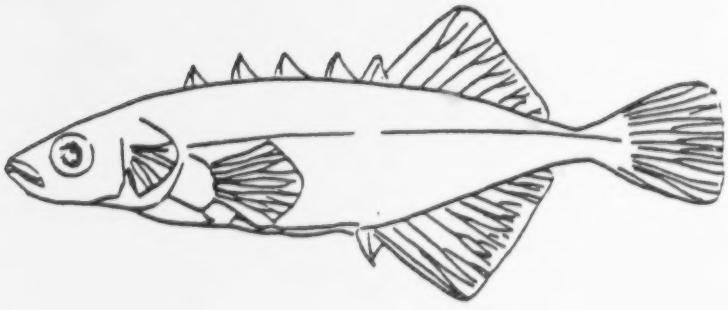
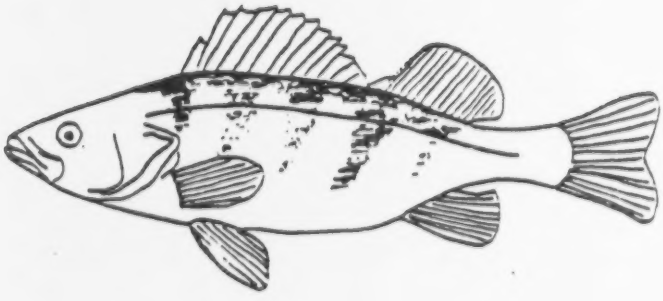
PROTECTION FOR LAKE ERIE FISH







In each circle, put the number indicating means of protection:
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TEACHER BACKGROUND - Protect Me!

"Protect Me! Helps the student to focus on some of the specific adaptations possessed by marine animals. The exercise requires recall of material from previous sections. Use this opportunity to further integregate the various topics covered up to this point.

Duplicate the activity page. One is recommended for each student. The students may work independently or in small groups. There is something to be gained from each approach. Select the methods that will work best with your class. The answers should be discussed while emphasizing the basic concepts covered. Teach the "Key Words" if they are unfamiliar to your students.

KEY

Each of the animals shown has several ways in which it protects itself. Some, but not all, are shown below.

1. Crab - pinchers, shell, color, walking ability
2. Fish - swimming ability, streamlining, spines, coloration
3. Chiton - shell, coloration, strong hold on rocks
4. Seastar - hard back, coloration walking ability
5. Hermit crab - withdraws into shell, pinchers, coloration, walking ability

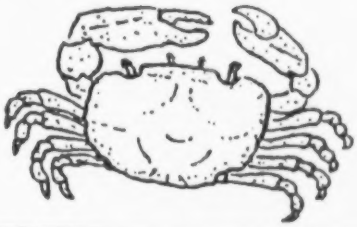
KEY WORDS

chiton
color
crabs
fish
hermit crab
pinchers
protect
seastar
starfish
swim
walk

Name _____

PROTECT ME!

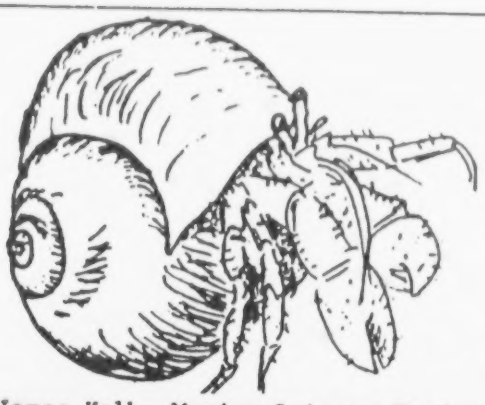
Name one way the following animals protect themselves from harm.

1. 

2.

3.

4.

5. 

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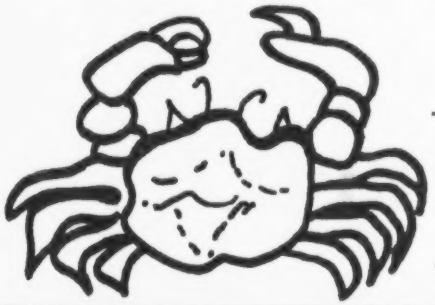
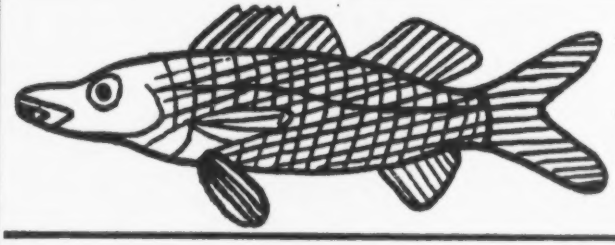
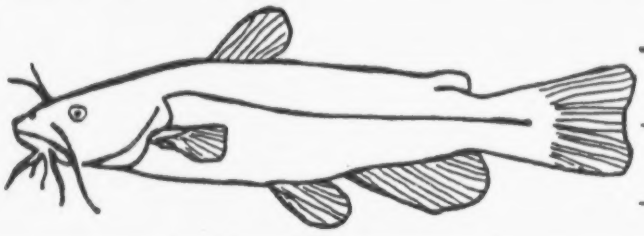
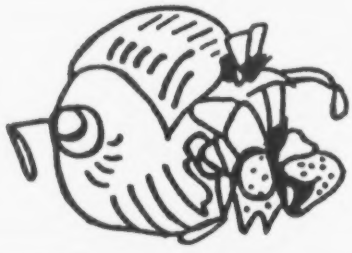
Where do I Live?

Two of these animals live in Lake Erie. The other three live in the ocean. Name the home of each!





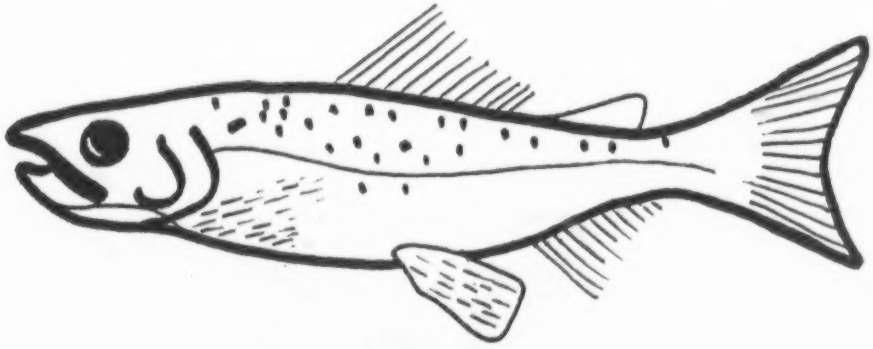




ADAPTED FROM KOLB, MARINE SCI. CTR

75

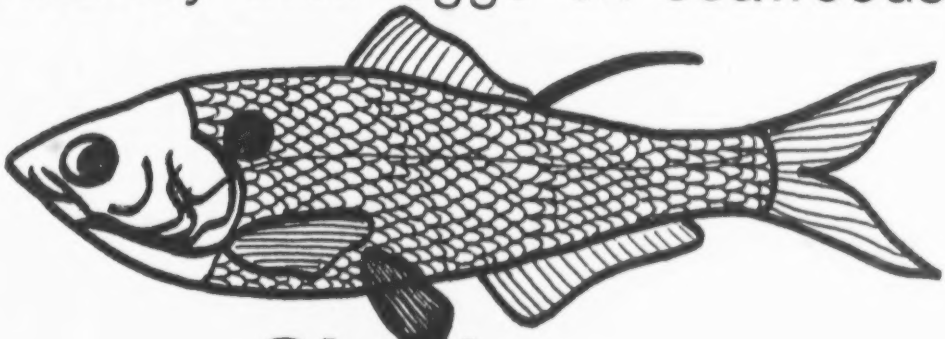
Each fish has its own life story. Salmon return to fresh water streams to lay their eggs. The baby salmon live in fresh water streams. Then they go to the sea to grow up.



Salmon

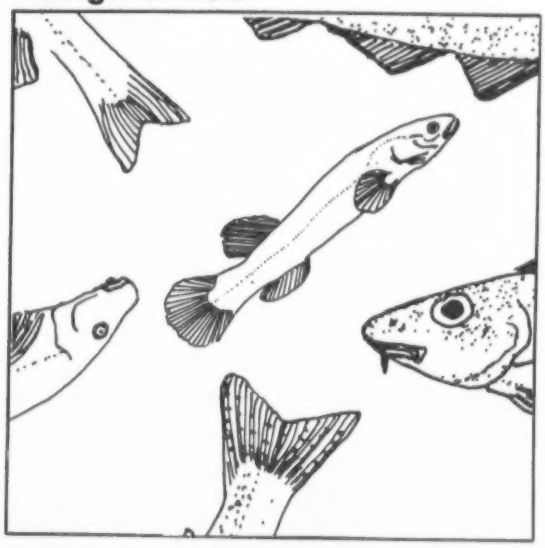
Where are salmon born?

Shad lay their eggs on seaweeds.



Shad

Design a Fish



Vocabulary:

- adaptation (review)

Materials:

- paper
- pencil
- colored tissue paper
- old newspaper or scrap paper for stuffing
- glue
- scissors
- felt-tip markers
- yarn or string

Procedure:

1. Have students create their own fish, adapted to a real or imaginary habitat. Have them first sketch their fish on paper and tell:

   - how it gets its food
   - what it eats
   - what eats it
   - where it lives
   - how it gets oxygen
   - how it moves in the water
   - where it hides
   - what its purpose is in life

   Encourage everyone to use imagination.

2. Have students make a tissue paper model of their fish by cutting the paper to the right size, then gluing three of the sides. After it dries, stuff the model with paper. Glue the last edge. Use felt-tip pens to add eyes and designs. Then tie yarn or string through the dorsal fins (or the tops of the fish) and hang them from the ceiling for a real fantasy fish world!

3. Have each student show his creation to the rest of the class, and tell about its wonderful adaptations.

From "Fish and Fisheries," Alaska Sea Week Curriculum Series VI.

Teacher's Information

Whales and dolphins, like marlin, tuna and sharks live in the sea and are fast swimming predators.

Although the first group are marine mammals and the second group are pelagic fishes, they have evolved many similar adaptations; so much so that whales and dolphins are often mistakenly referred to as fish.

This (transparency) may be used to illustrate discussions on the similarities as well as the important differences between these pelagic fish and mammals.

SIMILARITIES

Shape: have streamlined, cylindrical "torpedo-shaped" bodies for fast swimming.

Locomotion: have large, wide tail fins or flukes used for rapid propulsion.

Color: are darker on top (dorsal surface) and lighter on the bottom (ventral surface) which makes them difficult to see from above (against the dark bottom) and from below (against the lighter surface).

Feeding: have large mouths with sharp teeth for biting and tearing, but not for chewing. Their diet consists of live crustaceans, fish and in some cases marine mammals and birds.

DIFFERENCES

Locomotion: *Fish* use their body and tail in a side to side motion. These *marine-mammals* use their tails only, in an up and down motion.

Breathing: *Fish* have gills which absorb oxygen directly from the water. *Mammals* have lungs and must breathe air.

Reproduction: Most *Pelagic fish* lay eggs and the young must fend for themselves after hatching. *Marine mammals* give birth to live young which they nurse and care for until old enough to obtain food for themselves.

Temperature control: *Fish* have a body temperature that is the same as the surrounding water (they are "cold-blooded"); no temperature controls necessary. *Mammals* have a body temperature that must remain relatively constant (they are "warm-blooded"). They have a layer of blubber for insulation plus a complex heat exchanging vascular system in their tail and flippers.

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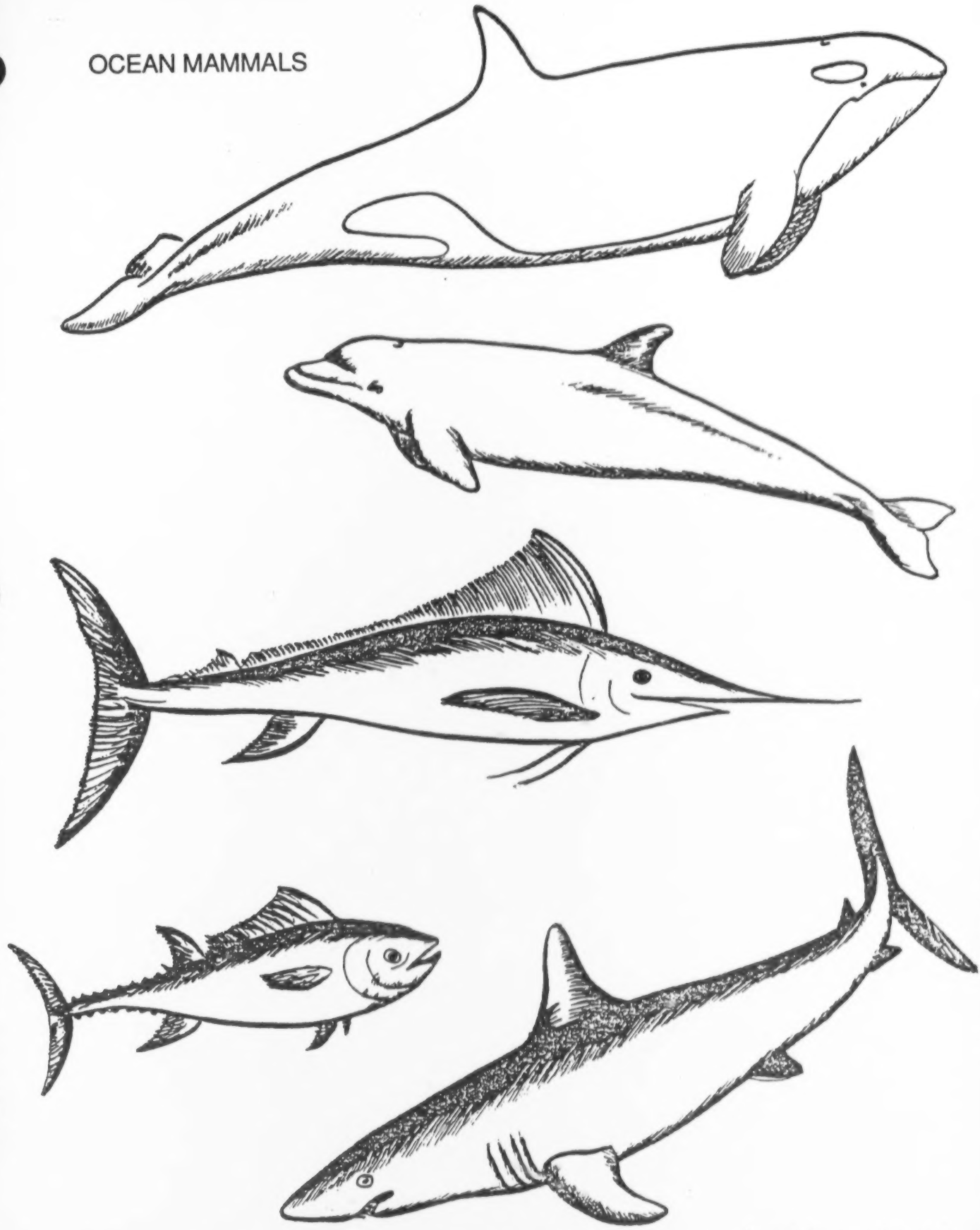
OCEAN MAMMALS



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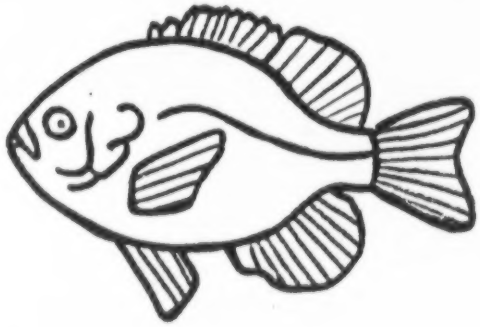


1. lateral line
2. gills-breathing
3. lays eggs
4. has scales
5. horizontal tail movement
6. "fish" group

1. sonar
2. lungs-breathing
3. bears young live
4. has hair
5. vertical tail movement
6. "Mammal" group

CHILD'S BOOKLET

When studying any unit, students learn and retain more when actively involved and personalizing the unit. A child's booklet helps to accomplish this. On the following page there is a cover for a child's booklet.

All dittos completed by the students as well as any experiments, art projects or other unit projects could be stapled together with this front page of the child's booklet.

The booklet could also be used as an evaluation for each day's work. The child could write or draw what he/she learned that day. These responses could then be compiled into the child's booklet.

I look at Lake Erie

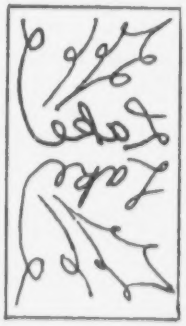
name _____

Art Activities

Lake Erie...a big mural of its uses or:

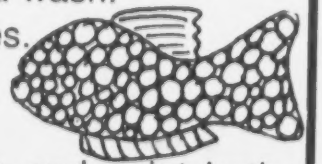
1. Water color the five Great Lakes.
2. Potato prints of Lake Erie.
3. Glacier pictures - use mixture of Tide and water...paint with two fingers to create glaciers.
4. Water color Lake Erie. Then use black marker or paper to illustrate a way one can enjoy Lake Erie.

5. Create ships, tankers etc. out of milk cartons or styrofoam.
6. Create dioramas showing how Lake Erie influences our weather, recreation, etc.
7. Create Lake Erie "monsters" or designs with printed or cursive writing of Lake Erie on fold of the paper.



8. Sponge paint the water...add boats, swimmers, fisherpeople, etc.
9. Make mobiles of Lake Erie uses.

10. Use clay, and finger impressions in the clay, to form a lake.
11. Create a Lake Erie scene and cover it with a"wash."
12. Draw a Lake Erie scene and fill it with circles.



13. Draw barges, freighters, or tugs. Stuff them and paint both sides.

Library Books

The following books are likely to be found in your school library:

Ships - Boats

Ships of the Great Lakes.....Buehr, Waller
Boat Book.....Gibbons, Gail

Ohio

Ohio's Natural Heritage.....Lafferty, Mike B.

Rivers

Rivers and Lakes.....Updegraff, Imelda and Robert

Fish

The Life of the Seashore.....Amos, William Hopkins
The First Book of Fishes.....Bendick, Jeanne
Along the Seashore.....Buck, Margaret W.
In Ponds and Streams.....Buck, Margaret W.
Fins and Tails.....Campbell, Elizabeth A.
Tide Pools and Beaches.....Clemons, Elizabeth
Fishes.....Fichter, George S.
Fishes, and How They Live.....Fichter, George S.
A Trip to the Pond.....Hofmann, Melita
The Fishes.....Life
In a Running Brook.....Lubell, Winifred
The Fishes.....Ommanney, Francis Downes
What is a Fish.....Darby, Gene
The Sunlit Sea.....Goldin, Augusta R.
Brian Wildsmith's Fishes.....Wildsmith, Brian
Fish is Fish.....Lionni, Leo
Fishy.....Lionni, Leo
The Science-Hobby Book of Fishing.....Shoemaker, Hurst
My Learn to Fish Book.....Denham, Ken
Pets From the Pond.....Buck, Margaret
Fish Do the Strangest Things.....Hornblow, Leonora and Arthur
Fishes.....Wildsmith, Brian
Some of Us Walk, Some Fly, Some Swim ...Frith, Michael
Adaptations.....Bindick, Jeanne
Fins and Tails: A Story of Stange Fish..Campbell, Elizabeth A.

Food

Eating and Cooking Around the World.....Berry, Erick
Eating Places.....Zim, Herbert S.

Animals

The True Book of Animals of Small Pond..Erickson, Phoebe
First Book of the Seashore.....Blassingam, Wyatt
Seashore-Seashore Creatures.....Jackson, Paul

Water Pollution

Our Dirty Water.....Elliott, Sarah M.
Rivers and Watersheds in
America's Future.....Helfman, Elizabeth S.
The Wildlife of North America.....Mason, George F.
Junior Science Book of Water.....Peterson, Otis
Clean Air, Sparkling Water; The Fight
Against Pollution.....Shuttleworth, Dorothy E.
The Life of Rivers and Streams.....Usinger, Robert Leslie
Ecology and Pollution/Water.....Gutnik, Martin J.

Erosion

The Wind Has Scratchy Fingers.....Rosenberg, Ethel C.

Pollution

Dinosaur.....Hoff, Syd
Chane and Time.....Podendorf,Illa
The Wump World.....Peet, Bill

Ecology

Ecology - The Circle of Life.....Hungerford, Harold

Key To Books

ADLS	All Day Long Songs. Shawnee Press, Inc.
AFSC	American Folk Songs for Children. Ruth Crawford Seeger. Doubleday & Co.
BMS-2	Birchard Music Series - Book Two. Summy-Birchard Co.
BMS-3	Birchard Music Series - Book Three. Summy-Birchard Co.
D	Discovery! M. Whitmark & Sons.
DMT-EC	Discovering Music Together - Early Childhood. Follett Publishing Co.
EM-I	Exploring Music I. Holt, Rinehart & Winston.
EM-III	Exploring Music III. Holt, Rinehart & Winston.
LM	Literature and Music. Tooze and Krone. Prentice-Hall, Inc.
MIM	Music Is Motion. Edna Buttolph. Willis Music Co.
MSF	More Singing Fun. McGraw-Hill Book Co.
MSGO	More Songs to Grow On. Edw. B. Marks Music Corp. Beatrice Landeck.
MYA-III	More for Young Americans - III. American Book Company.
NDM-K	New Dimensions in Music - Kindergarten. American Book Company.
SSS	Sesame Street Songbook. Warner Bros. Publishing Co.
SCS	Sierra Club Songbook. World Around Songs.
SaS	Sing a Song. Roberta McLaughlin & Lucille Wood. Prentice-Hall, Inc.
SBM-K	Silver Burdett Music - Kindergarten Book. Silver Burdett Co.
SBM-I	Silver Burdett Music - Book I. Silver Burdett Co.
SBM-II	Silver Burdett Music - Book II. Silver Burdett Co.
SBM-III	Silver Burdett Music - Book III. Silver Burdett Co.
SF	Singing Fun. McGraw-Hill Book Co.
SGO	Songs to Grow On. Beatrice Landeck. Edw. B. Marks Music Corp.
TIM-3	This Is Music - 3rd Grade Book. Allyn & Bacon.
TT	Tickle Tunes-Songs for Little People. Choristers Guild.

Songs About Bodies of Water, Fish, Fishing, Pollution, Ships, Sailing

Song	Composer	Source
All the Fish Are Swimming in The Water	American Folk	MSGO
All the Little Birds (Fish)	French Folk	SBM-K
Allee Alee O, The	American Folk	DMT-EC
At the Harbor	McLaughlin	SaS
Bell Buoy	Wood	MSF
Billowing Sails	Wood	MSF
Buying Fish	Yiddish Folk	SBM-III
Canoe Song	American Indian	EM-III
Cargo Workers	Sea Chantey	SBM-III
Come Boating With Me	Italian Folk	EM-III
Crowded Hole, The	American Folk	SGO
Don't Go Near the Water	American Folk	MYA-III
El barco chiquitito (The Little Boat)	Mexican Folk	MYA-III
Faithful Lighthouse	Wood	MSF
Ferry Boat	Buttolph	MIM
Ferryboat	Schubert	MSF
Ferryboat Is Coming	Wood	MSF
Fishpole Song	Southern Singing Game	SBM-II
Floating Down the River	Singing Game	SBM-K
Flounder, The	Broudy	D
Fog, The	Smith	MYA-III
Fog Horn, The	Haynie	EM-I
Freddy the Frog	Wright	TT
Frog, The	Broudy	D

Song	Composer	Source
Frog and the Mouse, The	American Folk	SGO
Frog in the Well, The	Appalachian	SBM-III
Frog Song, The	Traditional	SBM-II
Frog Went a-Courtin'	Virginia	AFSC
Haul on the Bowline	Sea Chantey	SBM-III
I Saw Three Ships	English Carol	EM-III
I Want To Go To the Beach This Summer	Wright	TT
I'd Like To Be a Lighthouse	Frankenpohl	EM-I
Imagination of Grand Sea	Japanese Folk	SBM-III
Jackfish, The	Appalachian	SBM-I
Land of the Silver Birch	Canadian Folk	EM-III
Let's Build a Boat	O'Leary	ADLS
Let's Go to the Sea	Guatemala Folk	SBM-I
Little Mister Polliwog	Wilkins	NDM-K
Little White Duck	Zaritsy	EM-I
Lonely Little Sailboat	Wood	MSF
Michael, Row Your Boat	American Folk	EM-III
My Boat	Hawaiian Folk	TIM-3
On, Roll On (En Roulant Ma Boule)	French Folk	MSGO
Over the Deep Blue Sea	Traditional	MSF
Picture a World	Riposo	SSS
Roll, Wave, Roll	O'Leary	ADLS
Row, Row, Row Your Boat	Traditional Round	EM-III
Sailboats	Buttolph	MIM
Sailing	Marks	MYA-III
Sailing Song	Sea Chantey	SaS

Song	Composer	Source
Seashell, The	Wood	SaS
Seashore	Traditional	MSF
Ship A-Sailing	English Folk	EM-III
Ships	Buttolph	MIM
Shore	Miller	NDM-K
Six Little Ducks	American Folk	EM-I
Stop the Poison	Donough	SCS
Ten Little Frogs	Pavelko	SF
There Was An Old Fish	American Folk	MSGO
Tug Boat	Buttolph	MIM
Voyageur, Le (The Voyager)	Canadian Folk	LM
Water Wheel, The	Japanese Game Song	SBM-II

RECORDS FOR RHYTHMIC ACTIVITIES

RECORD	COMPOSER
Barcarolle	Rubenstein
Boating on the Lake	Kullack
Boat Rhythms (Creative Rhythms)	Phoebe James
- Rowboat - Sailboat - Tugs and Liners	
Dance-a-Story	Barlin
- At the Beach - Little Duck	
En Bateau (In a Boat)	Debussy
To a Water Lily	MacDowell

Activities: Sway, rock, swing, push and pull, row, skate, haul anchor.

RECORDS FOR LISTENING

RECORD	COMPOSER
Children's Games	Bizet
- Leap Frog	
La Mer	Debussy
- Play of the Waves	
"Trout" Quintet	Schubert
- Fourth Movement	
Water Music	Handel
- Air - Hornpipe	

Records available in LRC in most schools

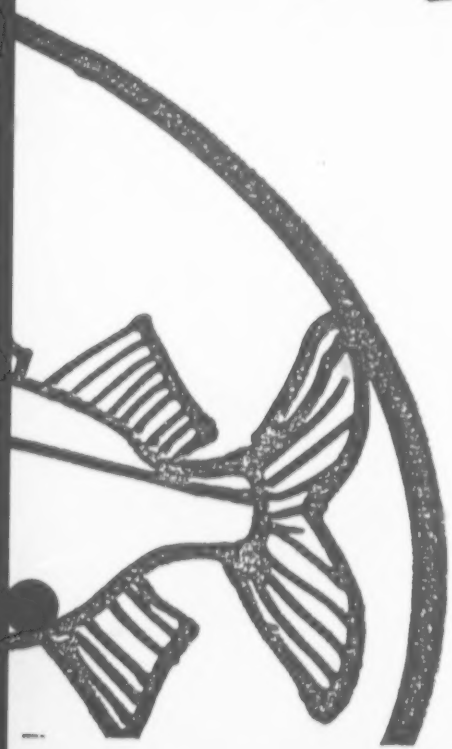
POSTERS FOR YOUR BULLETIN BOARD

The next eight pages may be removed from the unit and taped together in order or glued to poster board. If you laminate the resulting posters, they may be written on with water-base markers.

person
consumers
Wall

shad

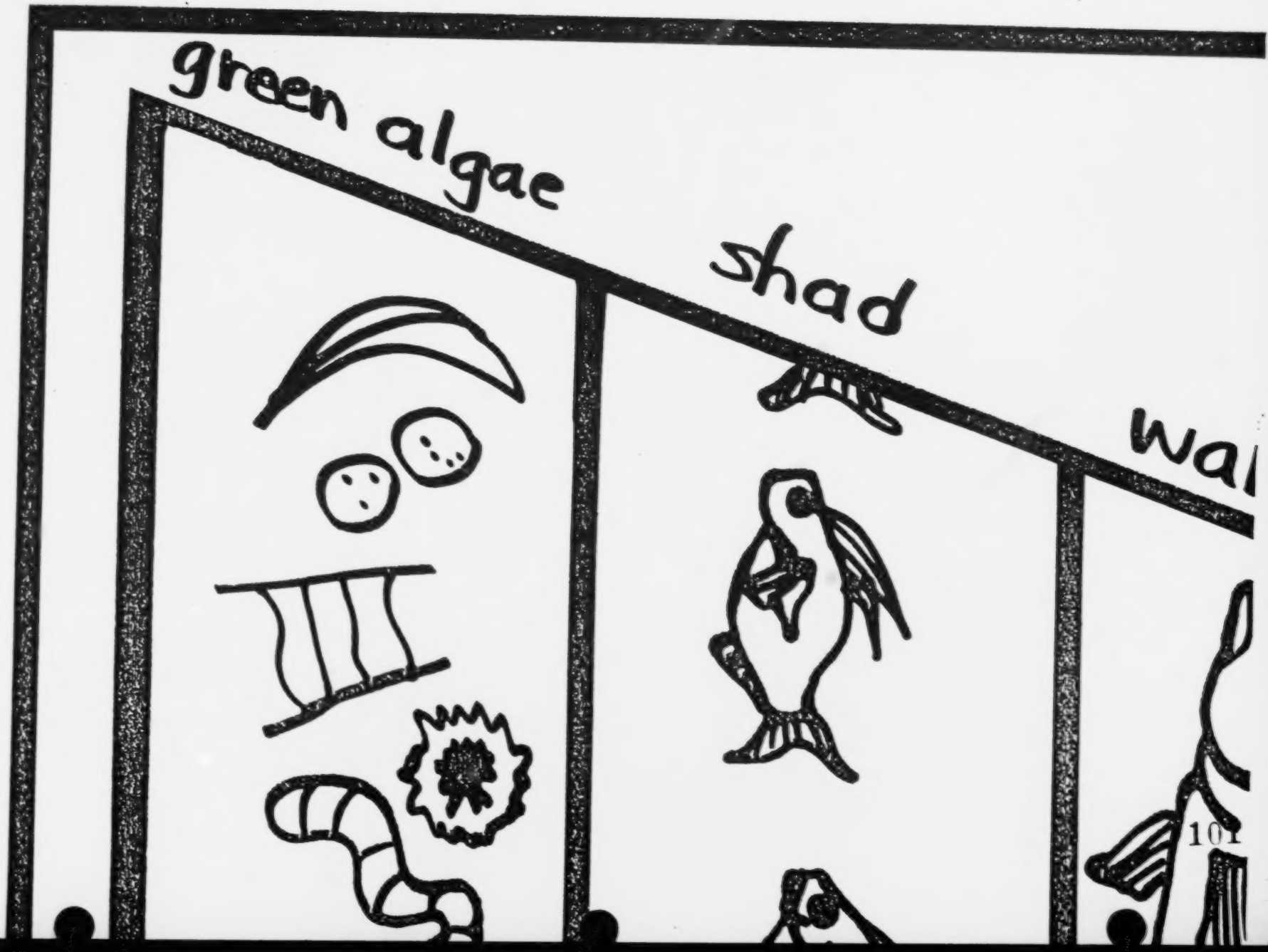
FOOD CHAIN



green
algae
producer

FOOD

Producer


green algae
shad
wal

YRAMID
consumers